



**TURBINE BLADE SURFACE ROUGHNESS EFFECTS ON SHEAR
DRAG AND HEAT TRANSFER**

THESIS

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Presented to the Faculty

Department of Aeronautical Engineering

Graduate School of Aeronautical and Astronautical Engineering

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Aeronautical Engineering

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Captain, USAF

March 2001

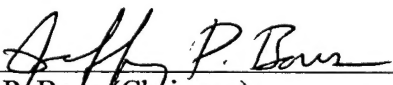
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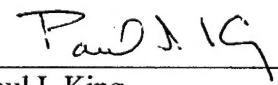
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Acknowledgments

I am greatly indebted to my thesis advisor, Maj Jeffrey Bons, who somehow made a monumental amount of work interesting and even fun. His technical expertise was obvious, yet he always remained open to my suggestions and comments. In the end, I see that the greatest personal benefit of this endeavor is what I've learned in the process. And what I've learned extends far beyond the pages of this thesis. I've honed my critical thinking and problem solving skills thanks to Maj Bons' guidance. Drs. Richard Rivir, Rolf Sondergaard, and Schichuan Ou have each helped me immensely; from suggesting another method when my procedure faltered, to assisting me with the execution of an experiment, to allowing me to use the AFRL Propulsion Lab resources. I would also like to thank Dr. B. K. Hodge and Steve McClain for their help and continued efforts from Mississippi State University on the computational aspects of this work. Finally, a big hug and kiss go to my wife, who married me despite hearing about the term "AFIT Widow". Her love and support during this first six months of our marriage has helped me through and given me perspective.

Jess W. Drab

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List of Symbols

Symbol	Definition	Dimension
<u>Regular Symbols</u>		
A	Area	m^2
c	Speed of light in a vacuum, 3.0×10^8	m/s
c_f	Friction coefficient	
C_L	Lift coefficient (aircraft)	
C_D	Drag coefficient (aircraft)	
C_p	Specific heat at constant pressure	J/kgK
D	Drag	N
E	Energy	J
E	Spectral emissive power	$W/m^2\mu m$
F	Force	N
h	Convective heat transfer coefficient	W/m^2K
h	Planck's constant, 6.626×10^{-34}	Js
H	Shape factor	
k	Thermal conductivity	W/mK
L	Lift	N
Nu	Nusselt number	
p	Pressure	N/m^2
Pr	Prandtl number, non-dimensional viscosity-to-heat transfer relation	
q	Heat flux	W/m^2
R_a	Centerline average roughness	μm
Re	Reynolds number, non-dimensional flow parameter	
R_q	Root-mean-square roughness	μm
R_t	Maximum peak-to-valley roughness	μm
St	Stanton number, non-dimensional thermal parameter	
t	Time	s
T	Temperature	K
u	Flow velocity in x-direction (parallel to wall)	m/s
u^*	Non-dimensionalized velocity, u/U_∞	
U_∞	Freestream velocity	m/s
v	Flow velocity in y-direction (perpendicular to wall)	m/s
x	Streamwise distance	m
y	Vertical height	m
y^*	Non-dimensionalized vertical height, y/δ_{99}	
<u>Greek Symbols</u>		
α	Thermal diffusivity	m^2/s

$\delta_{.99}$	Boundary layer thickness	cm
Δ	Difference or change	
ε	Spectral emissivity	
λ	Wavelength	m
μ	Viscosity	kg/ms
ν	Kinematic viscosity	m ² /s
ν	Frequency	1/s
θ	Momentum thickness	cm
ρ	Density	kg/m ³
σ	Stefan-Boltzmann constant, 5.669×10^{-8}	W/m ² K ⁴
τ	Shear stress	N/m ²

Subscripts

0	Initial value
∞	Freestream value
b	Blackbody
cond	Conduction
conv	Convection
d	Diameter
i	i th element
x	Local value
w	Wall

Abstract

Numerous past studies have looked at gas turbine blades and efficiency losses associated with blade surface roughness. Often these studies take a representative roughness measurement in order to create a statistically equivalent artificial surface, which may in turn be experimentally evaluated for friction coefficient or heat transfer rate. This work, like many before, seeks to characterize correlations between physical gas turbine blade roughness and friction coefficient (c_f) and convective heat transfer rate (h)—parameters which affect the engine's efficiency and the blade's lifespan. Instead of using statistically equivalent, but artificial, models of the actual surfaces, however, this study used scaled samples of the actual turbine blade surface. Surface measurements were made of nearly 100 different gas turbine blades. Depending upon the type of surface degradation, centerline average roughness (R_a) values of ranged from 1 to 30 μm . From the numerous surfaces available, four unique samples were selected for scaled model fabrication: two (2) erosion/deposit samples, one (1) fuel deposit, and one (1) corrosion/pitting. For the cases of typical erosion/deposits, friction coefficients up to 250 times higher and convective heat transfer coefficients of up to 150 times higher were found when compared to a baseline case (a flat plate). The other roughness types (pitting and fuel deposits) yielded less dramatic results. These results did not neatly fall in line with existing c_f -to- h correlations, such as the Reynolds analogy. While these analytical and empirical correlations hold for flat plates, they may be inadequate to describe the highly irregular surface roughness found on real in-service turbine blades.

TURBINE BLADE SURFACE ROUGHNESS EFFECTS ON SHEAR DRAG AND HEAT TRANSFER

I. Introduction

1.1 Background

The relationship between boundary layer development and shear stress over a flat surface and its convective heat transfer characteristics is well documented in viscous fluid or thermal energy texts. This relationship is also known to play a vital role in the design of turbomachinery, since roughened turbine components cause increased friction and heat transfer to the blade—thus reducing efficiency. Certainly the extreme temperatures of caustic post-combustion gases have such an adverse effect on turbine components that understanding the turbine environment is necessary for educated engine material and maintenance choices. Engine efficiency and lifespan are highly dependent upon the turbine, and much research—especially within the last 20 years—has been accomplished to characterize how in-service turbine blades rob total engine efficiency by absorbing heat from the post-combustion gases that flow through the turbine section. The dichotomy for turbine component operation centers on the need to keep the turbine components cool in order to prolong their lifespan, but to also reduce thermal energy transferred to them by keeping the components hot.

In either case, surface roughness has been exposed as an enemy to turbine components. As higher combustor exit temperatures are realized to achieve greater engine efficiency, the turbine blades experience the worsening of an already harsh environment. If the extreme heat of the combustor exhaust passes too rapidly into the turbine blades, premature deterioration of the blade structure occurs and necessitates earlier engine overhaul—a costly procedure that would certainly negate any previous benefit from the higher initial efficiency.

1.2 Problem Statement

Past research has primarily characterized surface roughness/heat transfer correlations either analytically or through the use of artificial approximations of the turbine blade surface. Often these representative test articles are composed of grains of sand or regularly/irregularly-spaced cones placed atop a flat surface to approximate the “peaks” of the actual roughness. These artificial roughness elements may be scaled to match roughness parameters from an actual turbine blade (Bogard et al., 1996:3). However, surface roughness and hence friction coefficient and heat transfer characteristics are closely tied to the “valleys” as well as the “peaks” of characteristic roughness.

This paper deviates from those turbine roughness studies that have preceded it by using scaled three-dimensional terrain of the actual turbine blade (including peaks, valleys, and other irregularities) as the test article. This real roughness is used to determine the friction and heat transfer correlations for typical types of turbine blade surface degradation.

1.3 Objective

The objective of this research effort is to conduct experiments to relate real turbine surface roughness to its friction and convective heat transfer characteristics. The test articles consist of three-dimensional recreations of actual turbine blade surfaces to account for both the peaks and valleys inherent in real turbine blades. The results of these experiments can be compared to past turbine roughness research, and to well-known turbulent boundary layer friction and heat transfer correlations, such as the Reynolds analogy.

1.4 Summary of Current Knowledge

As succinctly stated by R. P. Taylor in 1990, in-service turbine engine blades can be very rough (Taylor 1990:175). This notion is echoed in numerous turbine surface roughness reports, and this study supports those findings. In fact, roughness levels reported in the open literature (and corroborated in this study) regularly exceed peak-to-valley heights of 200 μm . Taylor also showed that roughness varies widely over the surface of the blade, with leading edges and pressure surfaces typically presenting the roughest areas. The problem of surface roughness can be exacerbated by the common use of thermal barrier coatings (TBC), which are 200~500 μm -thick ceramic coatings intended to alleviate metal fatigue due to extreme heat. However TBC, like metal, is not immune to gradual surface erosion. Worse still, TBC also tends to chip and pit (also known as spallation) when encountering foreign debris moving through the turbine, leaving large

(~500 μm) steps from the coated surface to the exposed metal. These areas of spallation can contribute greatly to the overall roughness of the blade.

The result of the increase in statistical roughness parameters—like root-mean-square (R_q), centerline average (R_a), and max peak-to-valley (R_t) roughness—is a corresponding increase in friction coefficient over the blade. According to Tarada and Suzuki, surface roughness enhances heat transfer by promoting earlier transition to turbulent boundary layer flow, and by increasing the total surface area available for heat transfer (Tarada and Suzuki, 1993:2). These two effects were exposed by Boynton et al, who used an abrasive flow polishing technique to reduce a turbine blade's rms roughness from 10.16 μm to 0.76 μm . The team reported a subsequent 2.1% increase in efficiency and a possible 32 K decrease in turbine inlet temperature (Boynton et al., 1993:614).

While it is not debated that a general increase in roughness contributes to a general increase in skin friction coefficient (c_f) and local convective heat transfer coefficient (h), there has been some discussion as to the direct applicability of roughness statistics to specific c_f and h values. Bogard et al. used a profilometer to measure R_a for two sample turbine vanes and determined that the statistic was “inadequate for predicting surface roughness effects on the flow and heat transfer” (Bogard et al., 1996:6). Instead, Bogard et al. chose to use a roughness/density parameter to estimate the turbine vane's equivalent sandgrain roughness height (k_s), a roughness parameter described by Hermann Schlichting (1979) and empirically tested for pipe flow by Nikuradse (1933). Sandgrain roughness is the height of densely packed grains of sand on a flat surface necessary to give a c_f equivalent to that of the surface of interest.

Bogard et al. went on to take heat transfer measurements on the equivalent sandgrain surfaces. But even though k_s may match friction characteristics, it may not adequately describe the heat transfer characteristics. As a uniform rough surface, the sandgrain approximation is not akin to the varied irregularities of an actual turbine blade, and the peaks and valleys have been shown to affect heat transfer in different ways. As reported by Kithcart and Klett, similarly sized peaks and valleys (represented by hemispherical bumps or dimples in their study) have similar heat transfer characteristics, but the valleys (dimples) exhibit about a 40% decrease in c_f (Kithcart and Klett, 1997:335). Thus using a test article that closely matches the surface of an actual turbine blade could bear different heat transfer characteristics than a uniform sandgrain test article with the same c_f .

Equivalent sandgrain roughness is one method among many of arriving at a deterministic representation of the real turbine surface. Some models are computational; some are physical. According to M. Acharya et al:

Most experiments dealing with rough wall boundary layers have considered either sand grain type roughness or a regular and discrete roughness geometry, usually two dimensional. The nature of flow over two-dimensional roughness is quite different from that over machined surfaces where the surface microgeometry is in general three-dimensional and cavities between roughness elements are less likely to have a strong influence (M. Acharya et al., 1986:34-35).

Although this statement was published in 1986, a quick perusal of the later works cited above show that the general experimental procedure remains, likely due to the ease of manufacture of the test articles with “regular or discrete roughness geometry” and repeatability of those tests.

A better understanding of a turbine blade's roughness statistics can help to more accurately predict its heat transfer. Experimental data can provide a growing database from which to draw correlations between different types of turbine component roughness and their corresponding friction and heat transfer characteristics. And using a model that incorporates real turbine blade roughness elements is a logical place to start.

1.5 Method

In order to accomplish the stated objectives, it was necessary to obtain skin friction and heat transfer data for real turbine blades. Though measuring these characteristics while the blade operates within an engine may provide the most accurate results, such an undertaking is understandably prohibitive. Instead, models of real turbine surfaces were created to provide a realistic and easily analyzed approximation.

In order to accomplish the eventual goal of collecting heat transfer data from surface roughness coupons, these general steps were followed:

- 1) Visually inspect each turbine blade, noting areas of differing roughnesses
- 2) Trace a three-dimensional map of a particular area of interest on the blade using a profilometer
- 3) Computationally remove the inherent three-dimensional curvature of the blade in order to obtain the roughness data over a flat subsurface
- 4) With a plastics printer, create scaled roughness coupons
- 5) Calculate c_f from momentum losses over the coupon
- 6) Calculate c_f from bulk shear drag
- 7) Use an infrared camera to obtain convective heat transfer data

This thesis is organized to first familiarize the reader with the procedures followed and the equipment used during experimentation. The Theory chapter shows the computational underpinnings and theoretical phenomena that govern the environment in which turbine blades and these tests were run. Surface roughness parameters, and boundary layer and heat transfer theory are discussed.

The Methods and Materials chapter explains what steps were taken and why. Major equipment and subsystems are also discussed here, both what the component is and does, and how it generally operates.

The Results chapter gives a detailed treatment of the results obtained from experimentation during this project, and compares these findings to previously documented results for roughness-heat transfer correlations.

Finally a Conclusions and Recommendations chapter offers a synopsis of this research effort and its relevance and application, and options for possible future study.

II. Theory

2.1 Surface Roughness

Surface roughness characteristics certainly are not the subject of analytical and computational study in the same vein that boundary layer or heat transfer characteristics are examined, so “theory” may be an excessive word to describe this section. Rather than attempt an exposé on roughness beginning from fundamental continuity, momentum, or energy equations, this section will serve simply to familiarize the reader with certain surface roughness parameters and describe how those parameters are physically relevant.

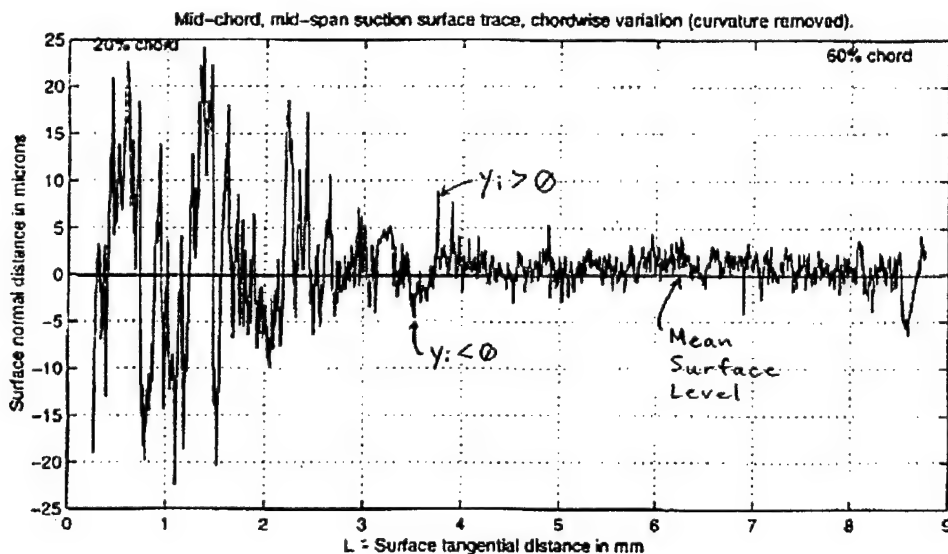


Figure 2.1 Example Roughness Trace (with curvature removed)

The most common descriptive parameters used by researchers studying surface roughness effects are root-mean-square (rms) roughness, R_q , average centerline roughness, R_a , and maximum peak-to-valley height, R_t , though many other parameters

exist. These values derive from simple statistical equations rather than fundamental laws of conservation.

In their book, Introduction to Surface Roughness and Scattering, Bennet and Mattsson list rms roughness as the most important and most commonly used surface statistical parameter (Bennet and Mattsson, 1989:38). It is measured along a line of length L , as depicted in Figure 2.1. The line defines a mean surface level such that equal areas of the surface's peaks and valleys lie above and below the line. The height of roughness is measured perpendicular to this line. Thus the mean surface level containing N distinct roughness elements is defined by

$$\sum_{i=1}^N y_i = 0 \quad (1)$$

The rms roughness is dependent upon the length of the trace taken (L), the surface area of the measurement, and the distance between the roughness elements. Typically, rms roughness is used to describe the finish of extremely smooth optical surfaces, and it is mathematically given by

$$R_q = \sqrt{\frac{1}{N} \sum_{i=1}^N y_i^2} \quad (2)$$

Average centerline roughness is typically used to describe machined surfaces, and represents the average deviation of the roughness elements (peaks or valleys) measured from the mean surface level. It is calculated by:

$$R_a = \frac{1}{N} \sum_{i=1}^N |y_i| \quad (3)$$

where N represents the total number of roughness elements along a given trace, and y_i is the height difference between the centerline and the i^{th} roughness element. Since the length of the trace affects the placement of the mean surface level for an irregular surface, a surface with pervasive but small roughness cannot share the same R_a value as an expanse of smooth surface with a few large roughness elements. This fact can be a help or hindrance, then, but R_a is best suited to characterize data for which the measured surface has fairly consistent roughness elements. If a surface contains no large deviations from its mean surface level, then rms roughness and R_a are very similar. If large peaks or valleys exist, however, then the squared y_i 's dominate and rms roughness becomes larger than R_a .

The maximum peak-to-valley roughness is exactly what its name implies, and is an indicator of the sheer size of the roughness elements. It is calculated as:

$$R_t = y_{\max} - y_{\min} \quad (4)$$

where y_{\max} is the maximum deviation from the average centerline and y_{\min} is the minimum (or greatest negative) deviation from the same reference. Also worthy of note are the statistical roughness parameters skewness, Sk , and kurtosis, Ku . Skewness

$(Sk = \frac{1}{R_q^3} \left[\frac{1}{N} \sum_{i=1}^N y_i^3 \right])$ is an indicator of the bias in the largest roughness elements to being

above or below the mean surface level. Kurtosis ($Ku = \frac{1}{R_q^4} \left[\frac{1}{N} \sum_{i=1}^N y_i^4 \right]$) is a measure of the general steepness of the roughness elements.

2.2 Boundary Layers

A boundary layer will develop as a fluid flows over a flat plate, as shown in Figure 2.2.

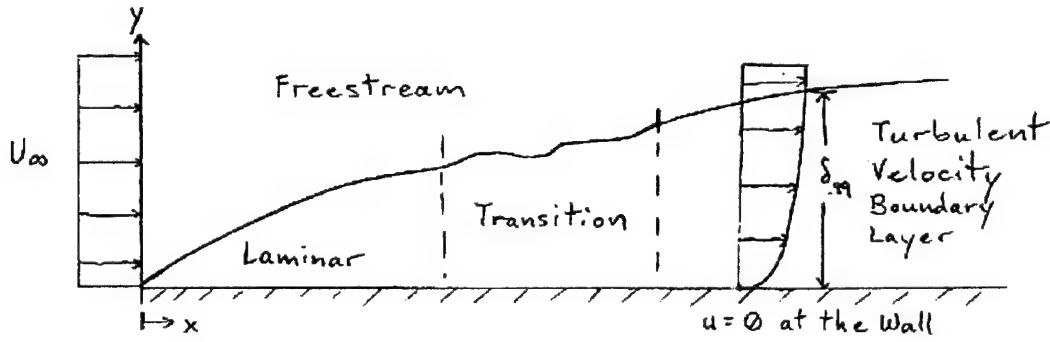


Figure 2.2 Velocity Boundary Layer Development

Between the plate surface ($y = 0, u = 0$) and the freestream ($y \geq \delta_{99}, u = U_\infty$), viscous forces within the fluid act to decelerate it. The resultant velocity gradient forces momentum transfer through the fluid between the top and the bottom of the boundary layer, which can be measured as shear stress, τ . Shear stress is proportional to the velocity gradient, and accounts for the fluid's ability to resist flow, also known as viscosity, μ . Thus,

$$\tau = \mu \left(\frac{\partial u}{\partial y} + \frac{\partial v}{\partial x} \right) \quad (5)$$

in a two-dimensional boundary layer where $w = 0$ and $\partial/\partial z = 0$. In the absence of blowing or suction at the wall, it can be assumed that no flow permeates the wall, thus $\partial v/\partial x|_{y=0} = 0$. The shear stress at the wall is of particular interest because it determines a component of drag and is an indicator of separated flow. For a 2-D boundary layer and for a impermeable wall, Equation (5) reduces to

$$\tau_w = \mu \left. \frac{du}{dy} \right|_{y=0} . \quad (6)$$

In much the same way that lift and drag forces are typically non-dimensionalized by dynamic fluid properties (e.g. $C_L = 2L/\rho U_\infty^2$ or $C_D = 2D/\rho U_\infty^2$) shear stress is given by:

$$\tau_w = c_f \frac{1}{2} \rho U_\infty^2 \quad (7)$$

where c_f is the skin friction coefficient, ρ is the fluid density, and U_∞ is the freestream velocity. Setting Equations (6) and (7) equal to each other gives:

$$\frac{c_f}{2} \frac{\rho U_\infty^2}{\mu} = \left. \frac{du}{dy} \right|_{y=0} \quad (8)$$

which relates friction coefficient to the velocity gradient at the wall.

Fluid flow parameters are often non-dimensionalized in order to facilitate comparison of dissimilar flow conditions or fluids. Reynolds number, Re_x , is the most common non-dimensional flow parameter, and is defined in Equation (9):

$$Re_x = \frac{\rho U_\infty x}{\mu} \quad (9)$$

where x is the streamwise location measured from some starting reference point (typically the beginning of the boundary layer). Note that the ratio μ/ρ is an indicator of viscous forces versus fluid momentum, and is also known as the kinematic viscosity, ν . Reynolds numbers in excess of 1×10^6 generally indicate fully turbulent flow over a flat surface. In-service turbine blades typically operate in flow with $1 \times 10^6 < Re_x < 5 \times 10^6$, depending upon blade size and rotational speed. The roughness panels in this research also encountered a turbulent boundary layer, as the data will show.

Friction coefficient, c_f , and Reynolds number can be related by defining dimensionless height and velocity as $y^* = y/x$ and $u^* = u/U_\infty$, then substituting into Equation (8). This gives

$$\frac{c_{f_x}}{2} Re_x = \left. \frac{du^*}{dy^*} \right|_{y^*=0} \quad (10)$$

where c_{f_x} is the local skin friction coefficient. Thus knowing the velocity gradient and fluid properties at a location on the flat surface gives the friction coefficient, which is a desired parameter for the purposes of the research. The non-dimensionalized height and velocity in Equation (10) also enable the substitution of a non-dimensional temperature gradient within a thermal boundary layer, as explained in Section 2.3 Convective Heat Transfer.

It would appear that taking a simple velocity profile measurement with a boundary layer pitot or hot wire device would supply the information necessary to

calculate the local c_{fx} . However, an accurate measure of the c_f for a large region of asymmetric roughness would require a prohibitive multitude of velocity profile traces. Additionally, obtaining an accurate reading for the velocity gradient at the wall would require instruments small enough to unobtrusively measure the laminar sublayer—a difficult task even for hot wire velocity probes. Luckily, an easier way exists.

The flowfield within a turbine is extremely difficult to accurately simulate. Focusing on the effect of roughness, however, several simplifying assumptions can be made. If a subsonic combustor exit flow is assumed to be two-dimensional and incompressible, the boundary layer over a turbine blade can be characterized by the reduced form of the continuity equation for incompressible flow:

$$\frac{\partial \bar{u}}{\partial x} + \frac{\partial \bar{v}}{\partial y} = 0 \quad (11)$$

where x is the streamwise direction and y is the direction normal to the surface. Note that, while there may be velocity components in the lateral z -direction within a turbulent boundary layer, it is assumed that the net average velocity, \bar{w} , equals zero. Assuming steady flow, momentum in the x -direction is given by:

$$\bar{u} \frac{\partial \bar{u}}{\partial x} + \bar{v} \frac{\partial \bar{u}}{\partial y} = U_\infty \frac{dU_\infty}{dx} + \frac{1}{\rho} \frac{\partial \tau}{\partial y} \quad (12)$$

and thermal energy is given by:

$$\rho C_p (\bar{u} \frac{\partial \bar{T}}{\partial x} + \bar{v} \frac{\partial \bar{T}}{\partial y}) = \frac{dq}{dy} + \tau \frac{\partial \bar{u}}{\partial y} \quad (13)$$

where T is the average fluid temperature and q is the heat flux. In Equations (12) and (13), q and τ include turbulent fluctuation quantities (White, 1991:265). It should be mentioned that pressure gradients do exist over highly-cambered turbine blades, but this research leaves the study of the effect of pressure gradients to future research efforts.

In accordance with T. von Karman's 1921 boundary layer analysis (White, 1991:265), multiplying the continuity equation by $(u-U_\infty)$ and subtracting it from momentum, then integrating the result from the wall to infinity gives the momentum integral relation:

$$\frac{\tau_w}{\rho} = \frac{\partial}{\partial x} \int_0^\infty u(U_\infty - u)dy + \frac{\partial U_\infty}{\partial x} \int_0^\infty (U_\infty - u)dy - U_\infty v_w \quad (14)$$

Assuming attached flow and an impermeable wall ($v_w = 0$), and dividing through by U_∞^2 gives:

$$\frac{\tau_w}{\rho U_\infty^2} = \frac{C_f}{2} = \frac{d\theta}{dx} + (2 + H) \frac{\theta}{U_\infty} \frac{dU_\infty}{dx} \quad (15)$$

where

$$\text{Momentum thickness,} \quad \theta = \int_0^\infty \frac{u}{U_\infty} \left(1 - \frac{u}{U_\infty}\right) dy \quad (16)$$

represents a quantitative measure of the shape of the velocity profile, and

$$\text{Momentum shape factor,} \quad H = \frac{\delta^*}{\theta} \quad (17)$$

Displacement thickness,
$$\delta^* = \int_0^{\infty} \left(1 - \frac{u}{U_{\infty}}\right) dy \quad (18)$$

In the absence of a pressure gradient that would serve to speed up or slow down the streamwise flow outside of the boundary layer, the second term goes to zero since $dU_{\infty}/dx = 0$. Finally, the remaining relation is:

$$c_f = 2 \frac{d\theta}{dx} \quad (19)$$

where θ is known as the momentum thickness and x is in the streamwise direction (White, 1991:429). Thus the average friction coefficient over a streamwise length of flat plate is given by determining the difference in the θ values at upstream and downstream locations. While the integral equivalent for θ may be difficult to visualize, the Figure 2.3 shows how two velocity profiles give the information necessary to find c_f .

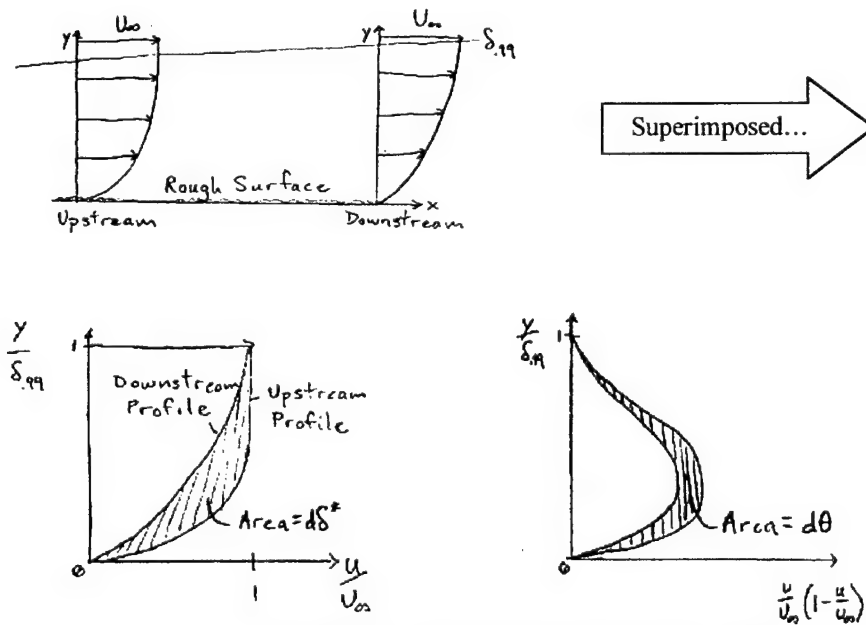


Figure 2.3 Graphical Representation of $d\theta$

2.3 Convective Heat Transfer

To understand the interactions between turbine surface roughness and heat dissipation within an engine, it is necessary to understand how thermal energy is transferred from hot post-combustion gases to the turbine blade surface. Heat transfer occurs between two or more regions of differing temperature via three main modes: conduction, convection, and radiation. Conduction involves thermal energy that is passed from adjacent molecules either within a homogeneous material or at the junction of two or more dissimilar materials. Convection is the transfer of heat from a solid surface to or from an adjacent moving fluid. It is essentially analogous to conduction, except that the fluid particles are now in motion either due to natural buoyancy forces or due to external or artificial action, such as that of a wind tunnel blower. Radiation is energy transferred to or from a surface via electromagnetic waves. While conduction and convection require a medium for the transfer of thermal energy, radiation does not.

In an operating turbine, the blades rotate through an extremely hot mixture of exhaust gases, establishing a local heat transfer situation as shown in Figure 2.4. As long as the throttle setting and operational altitude remain constant, the local heat transfer should also remain constant.

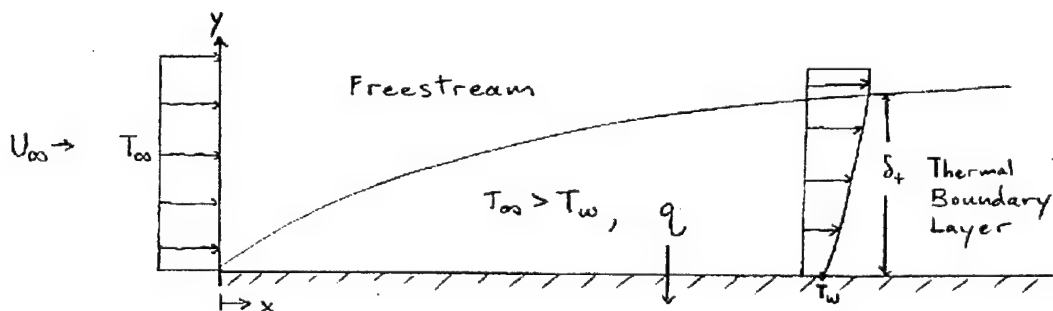


Figure 2.4 Thermal Boundary Layer Development

The heat transfer experiment carried out in this research attempts to recreate a similar heat transfer situation. Because air is a poor conductor of heat and particularly because the turbine blade sees fluid moving over it at such high velocities, convection dominates the heat transfer problem. In the wind tunnel, convection also dominated the experiment, and special care was taken to negate the effect of radiation from the tunnel walls.

In much the same way that a velocity boundary layer is established as fluid flows over a surface, a thermal boundary layer is formed over the region where temperature varies from the wall temperature, T_w , to the freestream temperature, T_∞ , as shown in Figure 2.4 above. The velocity and thermal boundary layers do not necessarily coincide, but they do have a marked effect on convective heat transfer. For instance, a turbulent boundary layer will generally increase the height of a thermal boundary layer since mixing within the turbulence aids in the transport of heat to or from the surface, steepening the thermal gradient near the wall.

Recall from the previous section that velocity gradient is related to friction coefficient by

$$\frac{c_{f_x}}{2} \text{Re}_x = \left. \frac{du^*}{dy^*} \right|_{y^*=0} \quad (10)$$

It turns out that friction coefficient and Reynolds number also relate to heat transfer. In the same way that the non-dimensional Re_x describes the moving fluid's inertial and viscous traits, a non-dimensional number can also be applied to convective

heat transfer characteristics of the flow. Local Nusselt number, Nu_x , represents the non-dimensional local temperature gradient and is given by:

$$Nu_x = \frac{h_x x}{k_f} \quad (20)$$

where h_x is the local convective heat transfer coefficient, k_f is the thermal conductivity of the fluid, and d is the vertical location above some reference. A large Nu_x indicates high heat transfer by convection. Stanton number, described later, is generally used to describe the convective heat transfer without the length scale, x .

In the absence of appreciable radiation, the local heat transferred from the fluid (or heat flux) by conduction must equal the heat flux due to convection, or $q_{xcond} = q_{xconv}$, at the flat surface. Conductive heat transfer is governed by Fourier's law of conduction,

$$q_{xcond} = -k_f \left. \frac{dT}{dy} \right|_{y=0} \quad (21)$$

Where $\left. \frac{dT}{dy} \right|_{y=0}$ is the temperature gradient in the fluid at the wall. Newton's law of cooling gives the rate of heat flux due to convection:

$$q_{xconv} = h_x (T_w - T_\infty) \quad (22)$$

Setting the two equations equal to each other gives the following relation for local convective heat transfer coefficient:

$$h_x = \frac{-k_f \left. \frac{dT}{dy} \right|_{y=0}}{T_w - T_\infty} \quad (23)$$

Thus the convective heat transfer coefficient depends on the temperature gradient at the wall, the thermal conductivity of the fluid, and the difference between wall and fluid temperature.

When the non-dimensional temperature gradient in a laminar boundary layer equals the non-dimensional velocity gradient, $\left. \frac{dT^*}{dy^*} \right|_{y^*=0} = \left. \frac{du^*}{dy^*} \right|_{y^*=0}$, then the thermal and velocity boundaries grow at the same rate. Then the kinematic viscosity, ν , and thermal diffusivity, α , also have the same value. Non-dimensional Prandtl number, Pr , relates these flow characteristics and is simply:

$$Pr = \frac{\nu}{\alpha} = \frac{\mu C_p}{k} \quad (24)$$

where C_p is the specific heat of the fluid at constant pressure. For the specific case of $Pr = 1$, as mentioned, velocity gradient in laminar flow can be replaced by the equivalent temperature gradient in Equation (23), producing:

$$\frac{c_{f_x}}{2} Re_x = \left. \frac{dT^*}{dy^*} \right|_{y^*=0} \quad (25)$$

where $\frac{dT^*}{dy^*}\big|_{y^*=0}$ is the dimensionless temperature gradient. Recalling that local Nusselt number is also equal to the local non-dimensional temperature gradient, Nu_x can be substituted into Equation (25) to produce:

$$\frac{c_{f_x}}{2} Re_x = Nu_x. \quad (26)$$

Another non-dimensional parameter, Stanton number (St_x), is sometimes used for streamwise locations instead of Nusselt number, and is defined by:

$$St_x = \frac{h_x}{\rho U_\infty C_p} = \frac{Nu_x}{Re_x Pr} \quad (27)$$

Stanton number simplifies the skin friction-convective heat transfer relationship to:

$$\frac{1}{2} c_{f_x} = St_x, \text{ when } Pr = 1 \quad (28)$$

Equation (28) is known as the Reynolds analogy and applies only when $Pr = 1$ in a laminar boundary layer. However, A.P. Colburn (Hagen, 1999:253) found that the analogy may be extended to turbulent boundary layers with $0.6 < Pr < 60$ and the following correction:

$$\frac{1}{2} c_{f_x} = St_x Pr^{\frac{2}{3}} \quad (29)$$

Thus the convective heat transfer coefficient is related to skin friction for turbulent flow over a flat plate.

Further mathematical gymnastics specify relationships between Re_x , Pr , and Nu_x to give average Nusselt number (Nu_x) values in turbulent flow ($1 \times 10^6 < Re_x < 1 \times 10^8$). Schlichting reports that $c_{fx} = 0.0592 Re_x^{-0.2}$ from empirical studies (Schlichting, 1979:639). Substituting Equation (29) into this expression results in (Hagen, 1999:253):

$$Nu_x = 0.0296 Re_x^{\frac{4}{5}} Pr^{\frac{1}{3}}, 0.6 < Pr < 60 \quad (30)$$

$$\text{or } St_x = 0.0296 Re_x^{-\frac{1}{5}} Pr^{\frac{2}{3}}, 0.6 < Pr < 60 \quad (31)$$

Integrating the local heat transfer coefficient within Equation (31) using the relation

$$\bar{h}_x = \frac{1}{x} \int_0^x h_x(x) dx \quad (32)$$

gives an average value for turbulent flow Stanton number,

$$\bar{St}_x = 0.0370 Re_x^{-\frac{1}{5}} Pr^{\frac{2}{3}}, 0.6 < Pr < 60, 1 \times 10^6 < Re_x < 1 \times 10^8 \quad (33)$$

In this study, the transient heat transfer experiment was set up as an isothermally soaked apparatus which heated up as hot air was forced through the tunnel and over the test articles. After the valves were opened, the flow through the tunnel ramped up to a steady speed within ~5 seconds. Once steady state velocity was achieved, the experiment could be considered a constant convective heat transfer problem, but the first several seconds of unsteady flow needed to be considered. Schultz and Jones (1973) used a

discrete approximation of Duhamel's method to account for the start-up heat transfer.

Duhamel's superposition integral equation (Kakaç and Yener, 1993:319),

$$T(x,t) = f(0)\phi(x,t) + \int_0^t \frac{df}{d\tau} \phi(x,t-\tau) d\tau \quad (34)$$

represented a means to solve a linear heat transfer problem given material properties and temperature history of the surface. This method assumed an isothermal starting temperature and a semi-infinite solid. Though the test articles were merely 1/4-inch thick, procedural steps were taken to simulate a semi-infinite roughness panel by terminating the experiment when the thermal wave reached the bottom of the test articles (see Section 3.3.3). Neither constant heat flux nor constant h were necessary conditions since heat transfer solutions were superposed at each successive time step. Shultz and Jones discretized and arranged Equation (34) by (Schultz and Jones, 1973:37)

$$h_i = \frac{\left[\frac{2k}{\sqrt{\pi\alpha}} \sum_{j=1}^i \frac{(T_j - T_{j-1})}{\sqrt{t_i - t_j} + \sqrt{t_i - t_{j-1}}} \right]}{T_\infty - T_i} \quad (35)$$

in order to obtain the convective heat transfer coefficient at the i^{th} time step with the conductive heat transfer coefficient of the rough surface, k , the thermal diffusivity of the surface, α , and the freestream temperature, T_∞ . The same method was used for this research.

2.4 Radiative Heat Transfer

Radiation theory, while factoring somewhat into the heat transfer experiment, is of greater benefit to understanding the operation of the infrared camera used in the same experiment.

All objects with a temperature above absolute zero emit radiation and, because radiative heat transfer can occur in the absence of a participating medium (i.e. a vacuum), it is the most common form of heat transfer. While electromagnetic radiation covers energy wavelengths from 1×10^{-10} μm (cosmic waves) to 1×10^{10} μm (electrical power waves), thermal radiation wavelengths vary from about 0.1 μm to 100 μm , as shown in Figure 2.5.

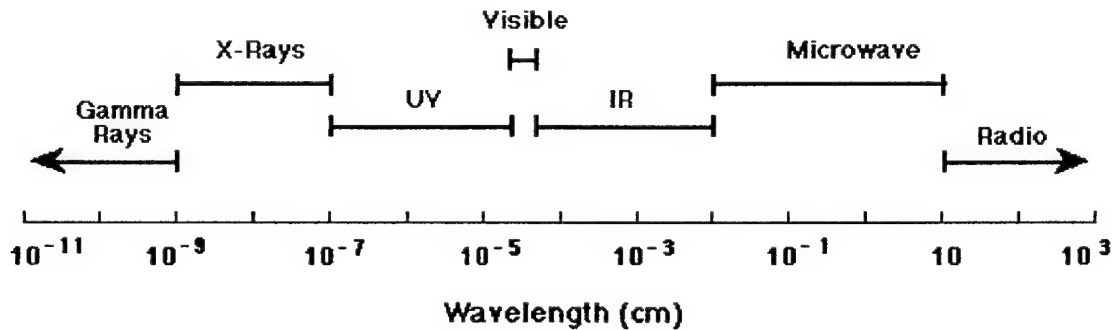


Figure 2.5 Electromagnetic Spectrum

Quantized energy is related to the electromagnetic wavelength by the relation

$$Energy = \frac{hc}{\lambda} \quad (36)$$

Where $h = 6.626 \times 10^{-34}$ Js is Planck's constant (not to be confused with the convective heat transfer coefficient h), c is the speed of light in the participating medium (or vacuum if applicable), and λ is the wavelength.

When an object emits radiation, it emits a wide range of electromagnetic wavelengths. The total emissive power per unit surface area, E , of an emitter accounts for the rate of energy given off from all emitted wavelengths. Since emissive power depends on material properties and surface temperature, two different materials at the same temperature can have different values for E .

In order to compare radiative properties of different materials, a reference object, called a blackbody, is established. The blackbody is a theoretical surface which is a perfect emitter and absorber of electromagnetic radiation. In other words, no object at a given temperature can emit more radiation than a blackbody at any wavelength, and a blackbody reflects no incident radiation.

While conduction and convection proceed linearly with temperature, the Stefan-Boltzmann law relates radiative heat transfer per unit area with temperature to the fourth power:

$$E_b(T) = \sigma T^4 \quad (37)$$

Where $\sigma = 5.669 \times 10^{-8} \text{ W/m}^2\text{K}^4$ is the Stefan-Boltzmann constant and $E_b(T)$ is the total blackbody emissive power.

Of course, $E_b(T)$ is an unattainable theoretical standard bearer; real materials emit power at some fraction of $E_b(T)$. This fraction is known as the material's emissivity, ϵ .

Emissivity is a function of a material, its temperature, and the wavelength and direction of the emitted radiation. A real object then emits radiation per unit area according to

$$E_b(T) = \varepsilon \sigma (T_{emitter}^4 - T_{receiver}^4) \quad (38)$$

If the emissive power can be determined by measuring the incidence of thermal energy wavelengths from a given surface, then temperature can be calculated using Equation (38). This is the basic principle behind the operation of an infrared camera, the specifics of which are described in Section 3.2.2 Infrared Camera Apparatus.

III. Materials and Method

3.1 Turbine Blade Roughness Measurement

Thanks to the cooperative aid of Honeywell, Solar Turbines, Siemens-Westinghouse, and General Electric, nearly 100 turbine blades were obtained for analysis. These blades had individually been operated over a wide range of 40 to 22,000 hours, and the type and severity of blade degradation varied widely as well. Blades with low hours did not necessarily have the best surface condition—a testament to the impact of the parent engine's operational environment on the blade status. For ease of categorization, the surface roughness was labeled as 1) corrosion/pitting (including TBC coating spallation), 2) deposits (including fuel), or 3) erosion/deposits.

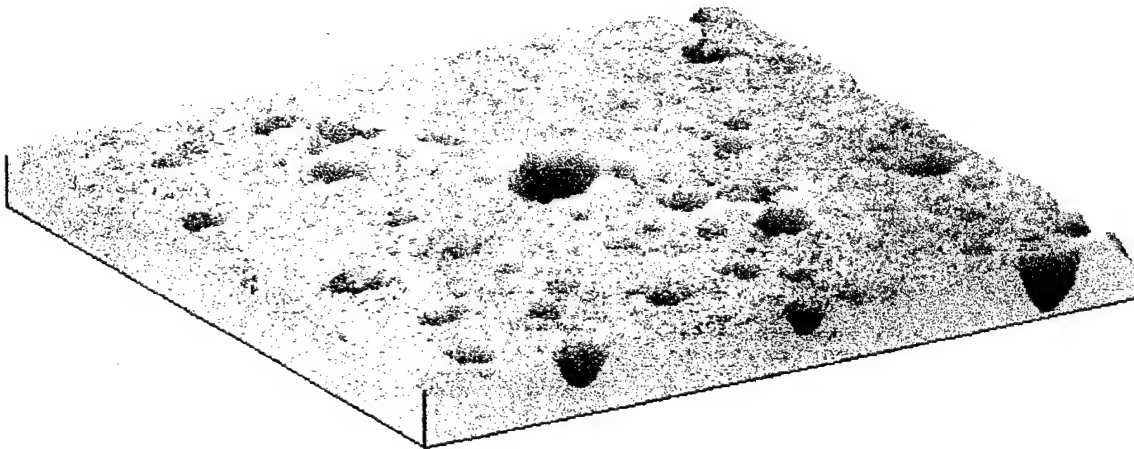


Figure 3.1 Pitted Surface Sample (Vertical Scale Magnified 9.1 Times)

Corrosion and pitting, shown in Figure 3.1, were characterized by deep and sudden changes in the blade surface. Such roughness occurred in both metal (non-coated) and TBC/alloy-coated blades, and could be caused either by foreign debris striking the blade as it passed through the engine, or by the superheated fuel-air mixture

attacking a weak area in the blade's surface. Visually, the corrosion and pitting took the form of small canyons (often found along the line of upper and lower surface cooling holes) or gouges and chips (most often found along leading and trailing edges). The "canyons" could achieve depths of 250 μm and widths of 5 cm, and snake along the entire surface of the blade in both chordwise and spanwise directions. R_a values could reach 25 μm in the corroded area. Although less dramatic, the pitted surfaces appeared more often than the canyons. Some pits were quite large (about 4 cm in diameter), but the R_a values were a comparatively tame 8~10 μm .

Fuel deposits were spotted in areas of dark brown discoloration where raised,

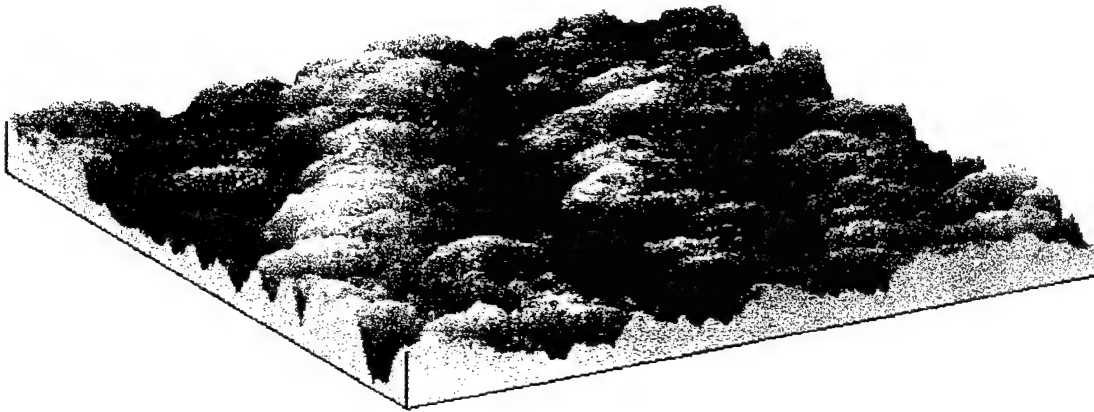


Figure 3.2 Fuel Deposit Surface Sample (Vertical Scale Magnified 2.4 Times)

rounded bumps were detectable. Often this occurred on the pressure side of the blade, or downstream of the cooling holes on the suction side. R_a values reached 10~14 μm , and the deposits, unlike the pitted surfaces, were typically raised above the mean level of the blade surface, as shown in Figure 3.2.

Erosion/deposits, shown in Figure 3.3, were a general roughening of the blade surface due to prolonged use or especially hostile operating environment. While the corrosion/pitting typically contained roughness elements below the mean level of the blade surface, and fuel deposits typically above, the erosion usually had peaks above and valleys below the mean level. Erosion occurred indiscriminately on the surface of the turbine blade, and color variations depended upon the type (if any) of surface coating and the duration of blade use. R_a values varied between 10~18. Erosion had sharper and steeper roughness elements than the fuel deposits, in general, and exhibited a grittier feel as a result.

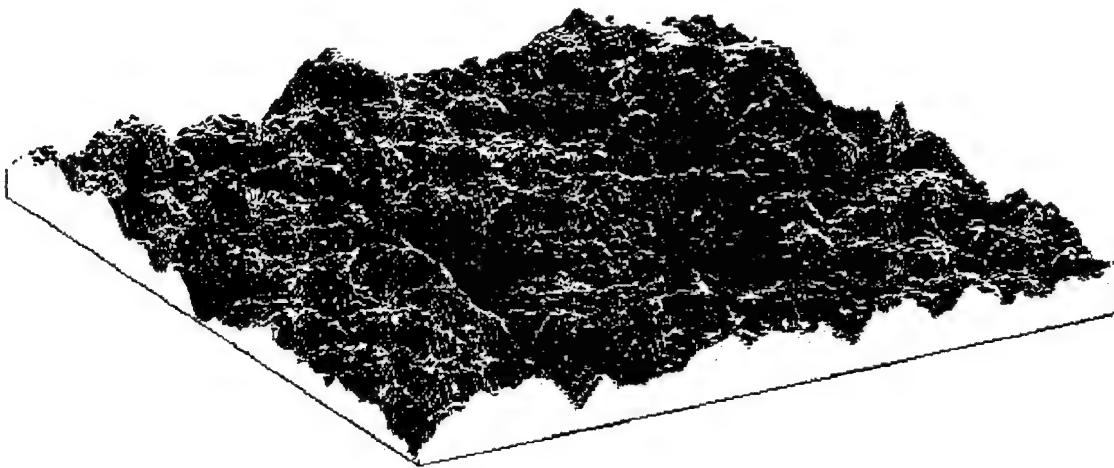


Figure 3.3 Erosion/Deposit Surface Sample (Vertical Scale Magnified 4.2 Times)

Although the extreme cases of roughness were interesting, even amazing at times, this research remained focused on the typical turbine blade still in service. To that end, only roughness coupons that were deemed representative of typical surface degradation were selected for further study. One surface with pitting, one with fuel deposits, and two with erosion/deposits were chosen.

3.1.1 Profilometer Apparatus

In order to obtain two-dimensional and three-dimensional roughness data, a Taylor-Hobson Form Talysurf Series 2 profilometer, shown in Figure 3.4, was used.

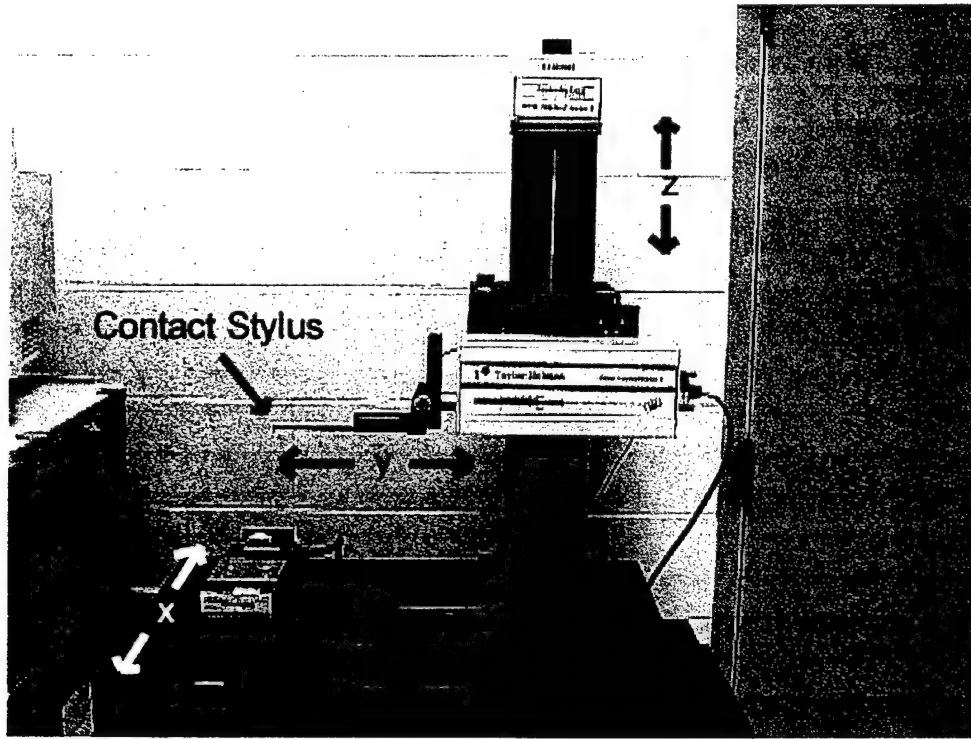


Figure 3.4 Taylor-Hobson Form Talysurf Series 2 Profilometer

The profilometer system was capable of positive or negative movement in the three ordinal axes. The device measured roughness by moving across the surface of the test article while dragging a diamond-tipped contact stylus over the surface. The 1.5 μm -radius conical tip of the 10 cm-long stylus rose or fell over the surface elements and its angular position data was transmitted to the dedicated Talysurf software analysis program. The angular position was then used to calculate the vertical height, dependent upon the length of the stylus. A 10 cm stylus offered a 2 mm vertical range at a

resolution of 0.032 μm , while a 5 cm stylus allowed only half the range but double the resolution.

3.1.2 Plastic Printer Apparatus

A Genisys Xs 3-D printer, manufactured by Stratasys Inc., was used to produce the representative roughness coupons. From a computer-generated CAD file, the Genisys Xs, shown in Figure 3.5, was able to make three-dimensional parts by extruding a bead of plastic polyester.



Figure 3.5 Stratasys Inc. Genisys Xs 3-D Printer

The 100 kg (225 lb) printer measured 91.2 cm wide, 81.2 cm tall, and 73.5 cm deep (36 in \times 32 in \times 31 in), and housed a computer controlled pump and printer tip, a Pentium-based microprocessor, and room for up to ten wafer dispensing cassettes. The 30.4 cm \times 20.3 cm \times 20.3 cm (12 in \times 8 in \times 8 in) platen (build area) allowed for an article of those dimensions to be printed, but each coupon printed for this research measured no more than 14 cm \times 1.5 cm \times 12 cm. The printer tip moved along the x-axis (toward the front or

rear of the machine), while the platen floor moved along the y- and z-axes. The wafer dispensing cassettes each held up to 50 rectangular wafers of the plastic polymer. The spring-loaded cassettes pushed the wafers into a pump, where the plastic melted as it was extruded through the 180°C (355°F) tip onto the 71°C (160°F) platen floor as a 0.33 mm wide (0.013 in) bead. The internal microprocessor communicated with the dedicated AutoGen software interface for Windows NT or UNIX. After selecting an STL file, AutoGen Version 3.1 allowed for the scaling and reorientation of the part before automatically printing it.

Each 14 cm × 12 cm printed coupon would later be arranged in groups of six to make a congruent surface 28 cm long × 36 cm wide. The Genisys Xs took approximately 4.5 hours for each part, which was built up from the platen floor in layers as high as the extruded plastic bead (0.33 mm). The parts sometimes became delaminated or bubbled up on the bottom surface, although the upper surface was unaffected in every case. Manufacturing irregularities in the test articles were not substantial enough to preclude their use in the experiment.

3.1.3 Roughness Measurement Procedure

After visually scanning the turbine blades for areas of interesting or representative types of roughness, the Taylor-Hobson profilometer was used to measure a square patch of roughness terrain. A 3-D surface was generated by taking numerous parallel 2-D traces, with a spacing of 5~40 μm between each 2-D trace. Luckily, this process was automated, since 3-D traces over a 4 cm × 4 cm area could take eight hours to complete. It was imperative to correctly set up the 3-D measurement boundaries to ensure that the 8~10 hours of machine automated operation would not go to waste. Since the stylus used

had a total absolute vertical range of 2 mm, no part of the measured area could deviate more than 2 mm from any other part in the z-axis. For surface measurements on a flat surface, this restriction presents no difficulty, but for the cambered surfaces of the turbines, much care was necessary to stay within this restriction. Several trial 2-D traces were initially used to check the highest and lowest points on the surface of the turbine. Once it was determined that the vertical extremes fell within the 2 mm tolerance, then the TalySurf software was used to accept inputs for the physical boundary of the measured area and the number of parallel 2-D traces within the area. The program took those inputs and automatically controlled the profilometer for the duration of the roughness extraction. Once the raw data was obtained, the TalySurf Ultra software package was used to input, analyze, and modify the surface. It generated an isometric view of the roughness coupon, and its pertinent roughness data.

The raw vertical position data included the inherent curvature of the blade. In order to isolate the roughness data, the dedicated TalySurf Talymap 3-D software was used to apply a 3rd-, 4th-, or 5th-order polynomial line fitting routine to estimate and remove the curvature of the blade from the raw data. The remaining data could then be analyzed for centerline average roughness (R_a) and peak-to-valley roughness (R_t), and then be compared against other blade results. Scaling factors were added to the vertical dimension of the roughness panels based on the estimated boundary layer thickness to roughness height ratio. The boundary layer dimensions in the tunnel were measured and known, but the flowfield in the actual turbine needed to be estimated. Using a typical Reynolds number based on chord of about 2 million (a typical value found in turbine airfoil literature), the standard boundary layer growth from the leading edge to the

chordwise location at this Reynolds number was calculated using $\delta = \frac{0.026}{\text{Re}_x^{\frac{1}{7}}}$, a common

flat plate boundary layer thickness-to-Reynolds number correlation. This gave an estimate for the boundary layer thickness on the actual turbine blade. The measured roughness height was then scaled to achieve the same turbine blade boundary layer thickness-to-roughness height ratio. The scaling thus depended on the blade size and the chordwise location of the roughness. Figures 3.1 ~ 3.3 depict the outputs of this process.

3.2 Skin Friction Coefficient Measurement

Once the turbine surfaces were measured for roughness and recreated through the plastic coupon generation, attention was turned to obtaining friction coefficient data for each surface. Two methods were chosen as vehicles for data collection: the momentum deficit method and the bulk drag method. The momentum deficit method was based on the theory presented in Section 2.2 Boundary Layer Theory, and used boundary layer pitot tube pressure measurements to assess velocity profiles over the rough test articles. The measurements were taken in a low speed wind tunnel with no pressure gradient and a trip-induced fully turbulent boundary layer.

The bulk drag experiment was envisioned to be a speedier way to achieve the same friction coefficient results. The bulk drag measurement results were referenced to the momentum deficit data in an attempt to corroborate the previous data and verify the bulk drag method as a viable and repeatable test.

3.2.1 Momentum Deficit Method

Skin friction coefficient was first calculated via the momentum deficit method. The test required a boundary layer wind tunnel operating at low freestream velocities but

with a fully turbulent boundary layer due to an upstream tripwire. The variable ceiling was adjusted for negligible streamwise pressure gradient. A boundary layer pitot was used to measure velocity changes very close to the test articles for accurate momentum thickness calculation. Due to possible spanwise variations in the flow, and because of the asymmetry of the roughness, three spanwise velocity profile pairs were taken and averaged for the accepted c_f value for that roughness panel.

3.2.1.1 Wind Tunnel Apparatus

In order to obtain friction coefficient data over the test articles, a boundary layer wind tunnel in the AFRL/PRTT Aero-Thermal Research Facility, shown in Figure 3.6, was used.

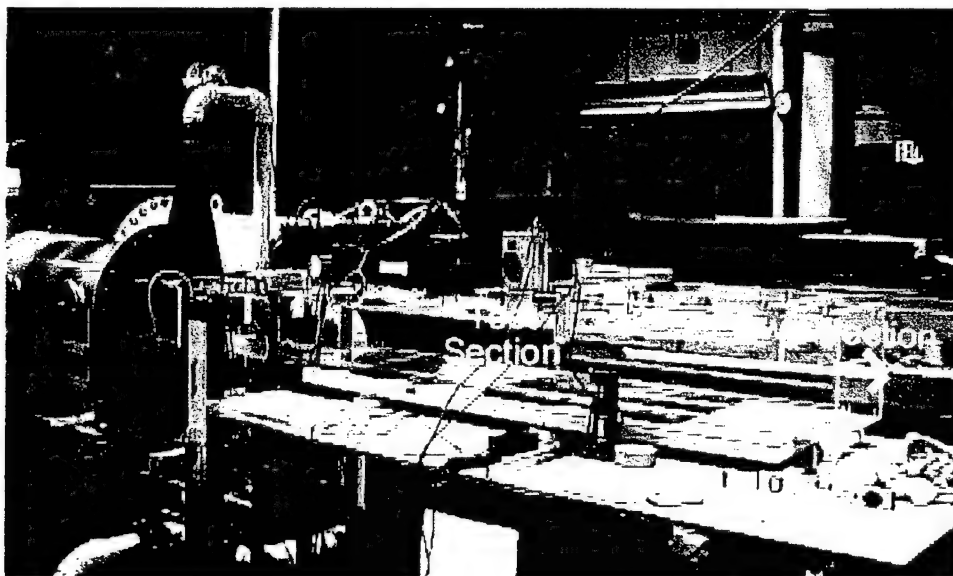


Figure 3.6 Boundary Layer Wind Tunnel Apparatus

Two independent blowers governed the tunnel airflow. Depending on atmospheric pressure and temperature, flow velocity through the tunnel was approximately 11 m/s (36 ft/s) for one blower, or about 18 m/s (59 ft/s) with both blowers running. Air entering the wind tunnel encountered a splitter plate, where a vacuum pump

provided suction to remove the lower part of the airflow, as shown in Figure 3.7. The boundary layer consequently began at the leading edge of the splitter plate and was tripped to achieve a turbulent state. The test section began 0.91 m (3 ft) from the splitter plate. The tunnel was fabricated from 2.54 cm (1 in) Plexiglas with an adjustable ceiling in order to introduce pressure gradients. The tunnel ceiling was not adjusted during testing, however, as no pressure gradient was desired. The floor of the tunnel was a 10 cm (4 in) thick length of plywood that could be lowered onto metal rails. The floor assembly then slid out from under the tunnel to allow easy access to the test section. The bottom of the tunnel walls were lined with foam weather stripping to ensure a flexible, airtight seal when the tunnel floor was raised into operational position. The tunnel cross sectional area was 38.1 cm wide \times 23 cm tall (15 in \times 9 in), or 871 cm² (135 in²).

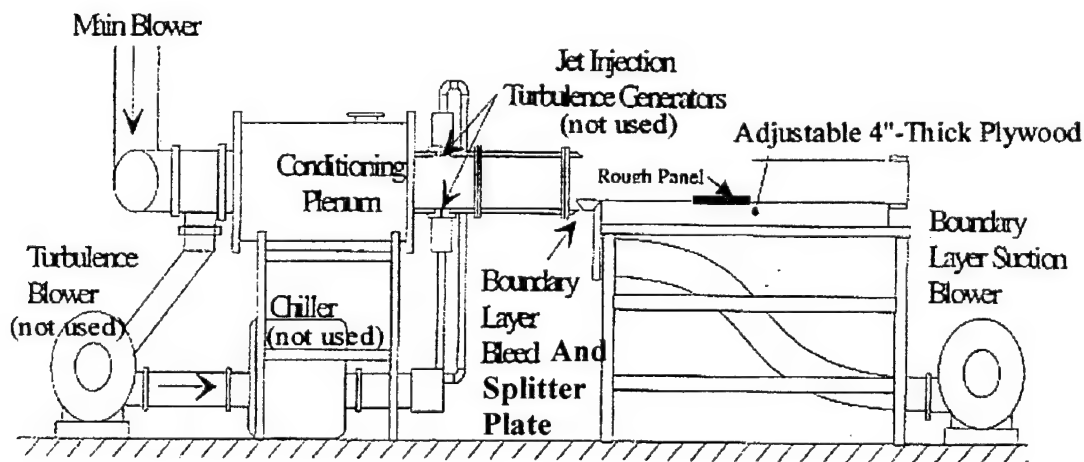


Figure 3.7 Boundary Layer Wind Tunnel Side View Schematic

3.2.1 Momentum Deficit Method

The boundary layer pitot tube was stepped from the surface of the test article to freestream conditions, taking pressure information at discrete y-locations. A thermocouple placed in the freestream provided temperature data, and atmospheric pressure and relative humidity were used to correct the velocity calculation for local weather conditions. These parameters enabled the conversion of the pressure transducer data into velocity. These calculations were accomplished using National Instruments LabVIEW software.

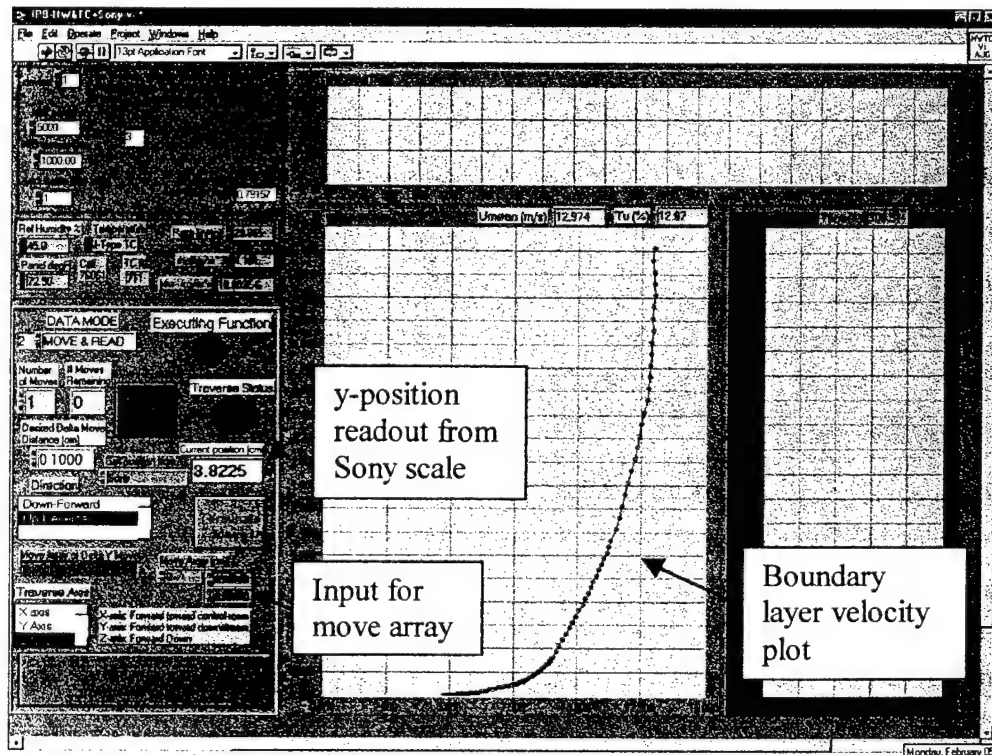


Figure 3.8 LabVIEW Boundary Layer Velocity Profile Measurement Program

The user interface, shown in Figure 3.8, accepted atmospheric pressure, relative humidity, and pressure transducer calibration information. (The Validyne Model CD15

carrier demodulator pressure transducer was calibrated regularly; its constants varied less than 0.5%.) The user could also designate and import the number of steps and individual step sizes associated with the data collection points. After physically positioning the pitot tube at the surface of the roughness coupon and turning the wind tunnel on, the user then would start the program to begin data collection. The LabVIEW algorithm operated the Velmex, Inc. VP9000 Traverse Controller, which in turn moved the traverse on which the pitot tube was mounted. Flow velocity, density, viscosity, temperature, and pressure at each y-location was relayed to the LabVIEW program and stored in an output file.

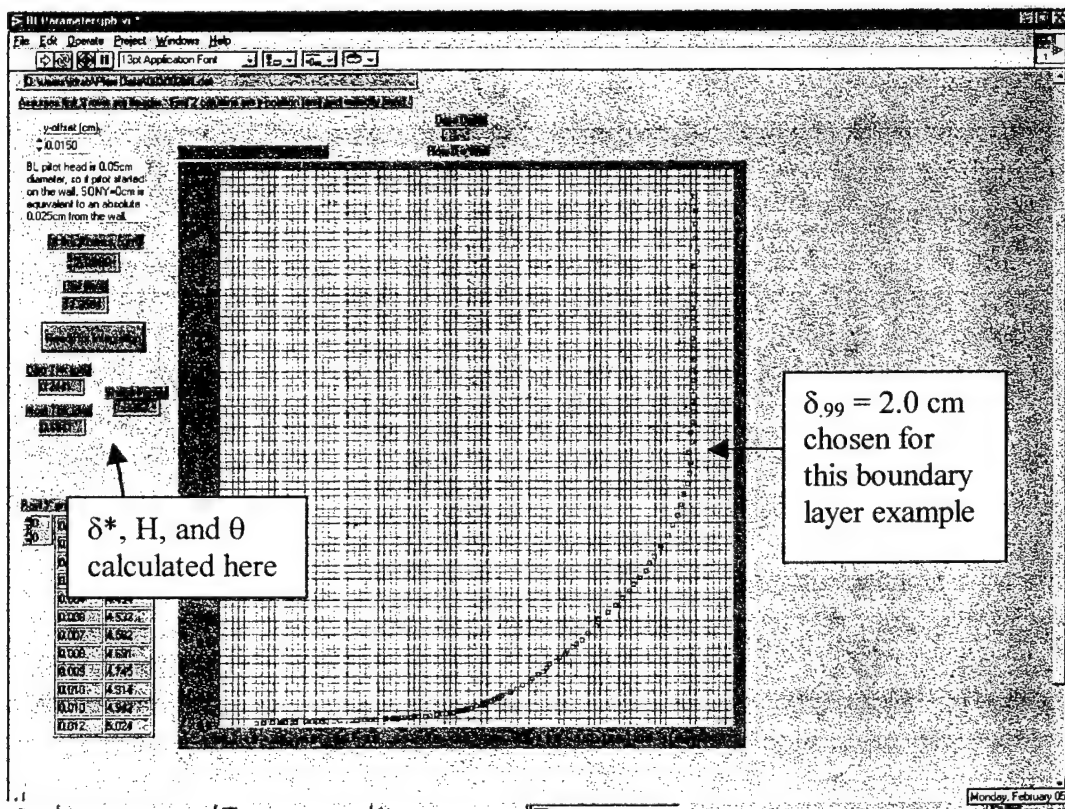


Figure 3.9 LabVIEW Boundary Layer Determination & Integration Program

Data was taken up to 4 cm (1.57 in) from the surface of the coupon in order to ensure that viscous effects from the floor shear were negligible. A Sony magnetic scale

relayed vertical position within 10 μm accuracy. Although a somewhat subjective procedure, the transition point between the boundary layer and the freestream ($\delta_{.99}$ point) was determined by searching a plot of the velocity profile for the point at which the velocity stopped increasing appreciably. Figure 3.9 shows an example of this analysis. Additionally, since each boundary layer traverse began with the tip of the boundary layer pitot probe touching the wall, the elevation of the first data point in the LabVIEW routine was adjusted up by the radius of the pitot tube tip (radius = 0.015 inches).

All data points above this transition point were averaged together to give freestream velocity, U_∞ . The velocity data, u , in the output file could then easily be inserted into Equation (16) from the previous chapter at each discrete y -step, and then summed from the floor to the $\delta_{.99}$ point in order to produce a θ value. Thus a single velocity profile at one x - and z -location delivered θ . In order to calculate c_f from Equation (19), however, it was necessary to take one velocity profile near the leading edge of the roughness coupon, and then another profile near its trailing edge. Measuring the distance between the two data locations gives dx , and the difference between the two θ values gives $d\theta$. Thus the quantities necessary for c_f calculation from Equation (19) are known.

In order to account for small spanwise variances in the flowfield within the tunnel, three spanwise (z) locations were chosen for velocity profile measurements. Each spanwise location was assigned a pair of velocity profile measurements; one upstream and one downstream. The centerline of the tunnel and positions 10 cm (3.94 in) to both sides of the centerline were chosen for each velocity profile pair, resulting in the grid

shown in Figure 3.10. Thus each roughness coupon yielded three separate friction coefficients (one for each spanwise location), which were then averaged to find the accepted c_f value for the surface.

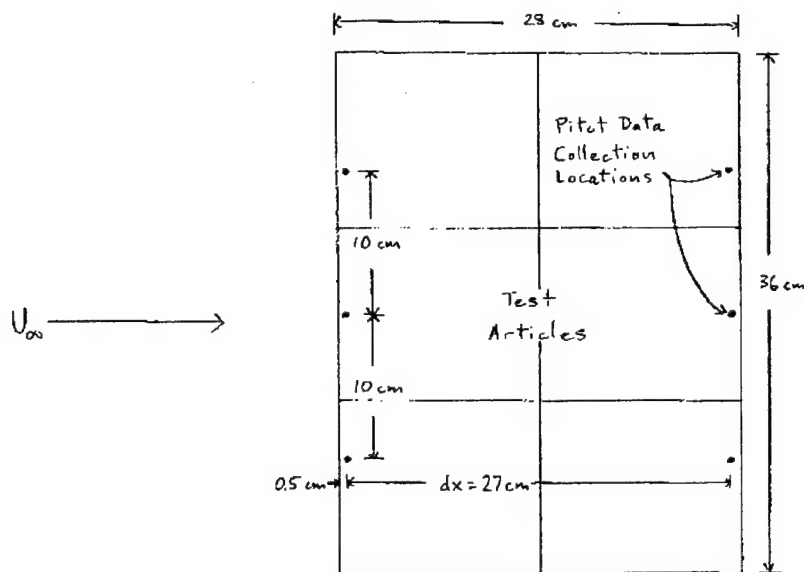


Figure 3.10 Velocity Profile Measurement Locations

3.2.2 Bulk Drag Method

In order to try a new (faster) method of c_f measurement and to corroborate the momentum deficit data, the tunnel was reconfigured to accept bulk drag testing. While test runs for each roughness surface could be accomplished in a fraction of the time required for completion of the momentum deficit procedure, the bulk drag method contained its own set of difficulties. The oscillations inherent in the free-swinging test apparatus blunted the fine resolution of the measurement equipment, and its sensitivity to rising or falling temperature made firm conclusions about the accuracy of the test results specious at best. The data reported is referenced to the flat plates only; no absolute c_f values are provided.

3.2.2.1 Hanging Plate Apparatus

Instead of setting the roughness coupons on an immovable Plexiglas sheet, the coupons were placed on a free-swinging aluminum floor. Binder clips were clamped at each corner of the aluminum plate to provide a place to attach suspension wires. Wire was tied to each binder clip and attached to an overhead rig. The rig, situated atop the wind tunnel as shown in Figure 3.11, was outfitted with screws which could adjust the tension in the wire wound around it. About 0.7 m (2.3 ft) of wire connected the rig and the hanging aluminum plate. The wire length was adjusted so that the leading edge of the roughness coupons abutted the edge of the Plexiglas floor at the same height.

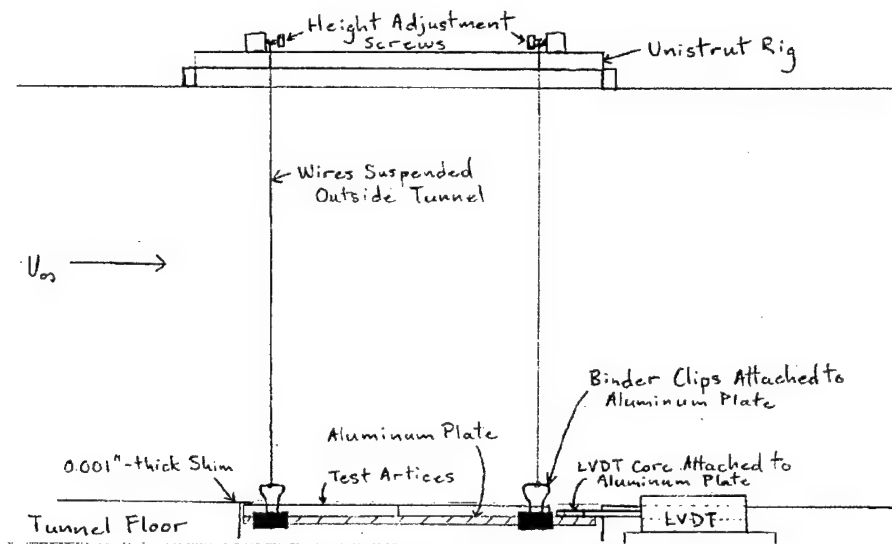


Figure 3.11 Hanging Plate Apparatus

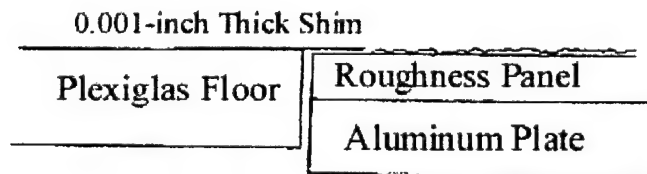


Figure 3.12 Overlapped Interface

To ensure that airflow would not force its way into this interface during tunnel operation, a 0.0254 mm (0.001 in) thick shim was taped so that it would hang over the interface, as shown in Figure 3.12.

According to theoretical predictions derived from T. von Karman's integral relations, friction coefficient and wall shear stress, τ_w , are related by the equation:

$$C_f = \frac{2\tau_w}{\rho U^2} \quad (7)$$

Assuming that wall shear stress is the only force (F) acting on the plate, then $\tau_w = F/A$, where A is the surface area of the plate. In the wind tunnel, the shear force is countered by the spring constant of the hanging plate apparatus as well as gravitational forces acting on the plate. When the tunnel blowers are activated, then, the flow produces a finite displacement of the panels. For a suspended plate, the force is linearly related to the streamwise displacement. Measuring the displacement of the rough surfaces gives a quantity which, if normalized by the displacement of the flat panels, gives a ratio of friction coefficients that represents the augmentation factor for the test article roughness.

3.2.2.2 LVDT Apparatus

The time advantages of this method are obvious, but accurately measuring small displacements while the aluminum platform is oscillating or vibrating in the airflow can be problematic. In order to reduce this uncertainty, a linear variable differential transformer (LVDT) was used to measure the rough surface displacement to within ± 0.0635 mm (± 0.0025 in). The Daytronic 3230 LVDT system consisted of a series of inductors coiled within a hollow cylindrical shaft, a solid cylindrical metal core, and a power source. The core slid into the center of the inductor sleeve without touching the

walls of the hollow shaft, and with very little tolerance. When the inductors were excited by an electrical current, a certain output excitation voltage registered on a multimeter. Inserting the metal core into the hollow shaft changed the magnetic field established by the electrically charged inductors, and thus registered as a voltage change on the multimeter. With careful calibration, the linear change in voltage could exactly match the core displacement in centimeters or inches, or be a multiple thereof. This measuring device provided excellent resolution due to the lack of friction, while the low mass of the core maintained the sensitivity of the positional data during the dynamic tests.

3.2.2.3 Bulk Drag Procedure

The inductor coil sleeve was mounted outside of the wind tunnel, just downstream of the aluminum plate. The core was attached to the plate and carefully aligned so as not to touch the walls of the sleeve when the plate moved. It was also necessary to recognize and characterize, during calibration, a limited range of linearity for the LVDT and situate the core within that range.

When the tunnel was in operation, the roughness coupons and aluminum plate were displaced some finite amount (on the order of hundredths of an inch). But turbulence in the boundary layer caused small, consistent fluctuations in the LVDT voltage. A LabVIEW program was written to continuously sample the LVDT voltage readings and plot them, and average a subset of those data points. This program served to both obtain an accurate average displacement and to track settling trends in the readings. Adequately warming the tunnel by continuous operation eliminated most error due to settling, but the LabVIEW plot provided an easy way to ensure that the average displacement was not drifting over time.

The tunnel was run with one blower for a duration of approximately 30 minutes, at which time the tunnel components reached a steady temperature of about 27°C (80°F). The tunnel blower was turned off and the LVDT core/aluminum plate assembly was quickly adjusted to make certain that the leading edge of the plate just rested about 1 mm (0.04 in) from the end of the Plexiglas floor, as shown in Figure 3.11. The LVDT voltage reading was recorded and one tunnel blower reactivated. A voltage reading was again taken once the roughness panels reached equilibrium. Finally, the second blower was activated and another LVDT reading was taken before the tunnel could heat up further. With both blowers on, the tunnel reached a steady temperature of about 38°C (100°F), and the data showed an increase in average plate displacement over time due to the rising temperature. So taking a voltage measurement as quickly as possible after turning on the second blower was paramount for an accurate depiction of the plate displacement. In reality, measurements taken with both blowers operating were a means of corroborating the validity of the displacements measured with one blower on. Since displacement should vary with the square of velocity, then the two-blower data offered a quick check. This data could not be compared to the momentum deficit data, since all momentum deficit data was taken with only one of the blowers running.

3.3 Convective Heat Transfer Measurement

The final data-gathering phase of this project involved collecting convective heat transfer data over each of the roughness coupons. Two avenues were available for this data collection: transient and steady state. The transient method offered the advantage of saving time and being compatible with the existing test set up. The steady-state method offered better repeatability and less complex mathematical governing equations, but

would require major adjustments to the test set-up. Due to the sophistication of the infrared (IR) camera and in the interest of time, the transient method was selected as the vehicle for finding convective heat transfer coefficients (h) for each surface.

3.3.1 Wind Tunnel Reconfiguration

The wind tunnel was slightly modified to facilitate temperature measurements. The sliding plywood floor of the tunnel was left fixed upon blocks and the roughness panels were mounted on a 1/4-inch Plexiglas slab and slid into a cavity approximately 0.96 m from the leading edge of the tunnel floor. The panels could then be raised flush with the floor. A ceiling panel with a 3-inch diameter hole was placed above the test articles. The IR camera was then situated over the hole and focused on the roughness panels.

3.3.2 Infrared Camera Apparatus

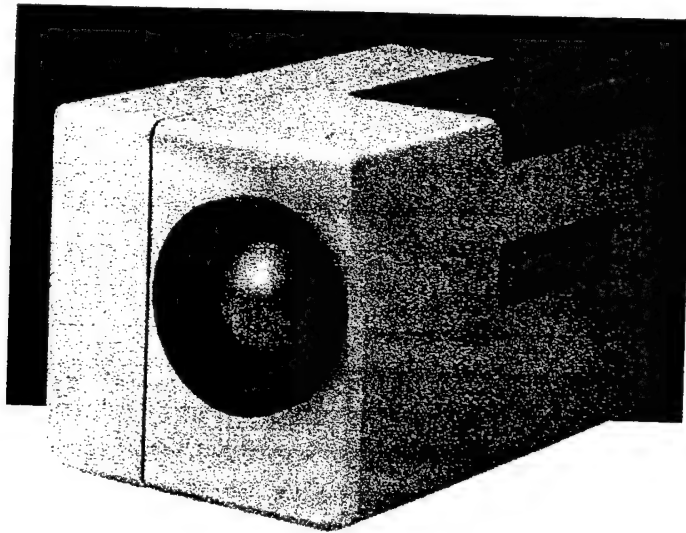


Figure 3.12 FLIR Systems ThermoCAM SC 3000

The device used for temperature measurements was the FLIR Systems ThermoCAM SC 3000, shown in Figure 3.12. The camera offers a high-quality, non-

intrusive method of obtaining thermal data, and its associate software package simplifies the data analysis. The camera had the capability of measuring -40°C to 500°C (-40°F to 932°F) and optional filters extended the upper range to 2000°C (3632°F). The camera could sense temperature changes of 0.03°C at 30°C , and claimed an accuracy of $\pm 2\%$ or $\pm 2^{\circ}\text{C}$ of the measured value, whichever was larger. However, the experimental starting temperature was typically within $\pm 0.5^{\circ}\text{C}$ when compared to the thermocouple reference, and the camera was able to sense temperature differences of 0.03°C . The 3.2-kg camera was 220 mm long \times 135 mm wide \times 130 mm tall, and housed a Quantum Well Focal Plane Array (QWIP) which received and recorded the thermal electromagnetic radiation between 8–9 μm in a 320 \times 240-pixel field. The internal components were cooled to 70 K via a stirling cooler.

3.3.3 Transient Convective Heat Transfer Procedure

The transient method involved establishing isothermal steady-state temperature throughout the wind tunnel by allowing it to sit idle for at least three hours. The test articles were instrumented and installed in the tunnel prior to this idle period to ensure isothermal temperatures throughout. Each roughness set was instrumented with a thermocouple flush with the underside of the test article ($1/4$ -inch below the roughened surface). The history of the thermocouple was tracked during each test run, and provided the time at which the thermal wave soaked through the surface and reached the bottom of the test article. This time was used as the cut-off for data reduction, since data could be erroneous if the thermal wave bounced off of the bottom of the test article and returned to the surface. Ideally, the plastic panels and the Plexiglas would have the same thermal

properties and the thermal wave would simply be conducted to the bottom of the Plexiglas sheet with no intermediate reflection. However, the thermal properties of the plastic panels were not verified and the more conservative test duration (about 50 seconds) was used.

One pressure-operated valve was opened to allow air through an alternate wind tunnel on the same supply ducting. This valve was wired to a similar (shut) valve on the boundary layer wind tunnel, and both were operated via the same air pressure line. An additional manually operated butterfly valve ensured that no airflow could enter the boundary layer tunnel. Once the test articles and wind tunnel were verified as isothermal, the experiment could commence. During the last 10 minutes of the idle period, the blowers and heaters were turned on and sent through the alternate tunnel. Flow temperature was adjusted to about 63°C (145°F). The IR camera was set up to take thermal images of the roughened surface at about one-second intervals. At the same time that the IR camera started taking pictures, a freestream thermocouple was pulled from its reference junction and reconnected. This procedure produced a data spike in the thermocouple/pitot data collection program that could later be synchronized to the start of the IR camera sequence. After data collection was initiated, the two pressure-driven valves were simultaneously operated to shut off the alternate tunnel and open the boundary layer tunnel. The butterfly valve was then opened as the boundary layer suction was turned on, and the experiment was underway. Steady flow was established within about five seconds and data was collected for about 90 seconds.

The IR camera saved thermal images of the surface on a removable data storage card. The sequence of images was then ported to a computer with dedicated Agema

Research Software, which was then used to find an average temperature value for each snapshot. The field of view at the 0.37 m focal distance was approximately 100 mm × 100 mm. The camera was placed over the center of the downstream roughness panel, and software was used to calculate the average temperature of the middle ~64 cm² of the field of view over time. This temperature history needed further massaging, however, since ambient temperature—one of the parameters affecting surface temperature measurement—was not constant for the duration of the test. The freestream ambient temperature history, collected via thermocouple during the experiment, was used to properly adjust the IR surface temperature data. Once the corrected temperature history was obtained, the Schultz and Jones method (Section 2.3) could be employed to find convective heat transfer coefficient during the test.

IV. Results and Analysis

4.1 Roughness Results

The results of the contact stylus measurement for the various roughness samples are summarized in Table 4.1.

Table 4.1 Turbine Blade Roughness Statistics

<u>Surface Type</u>	<u>Region</u>	<u>Hrs</u>	<u>Process</u>	<u>Original Size (mm)</u>	<u>Scaling Factor</u>	
Pitted	SuctionSide/MidSpan/TE	15000	Pitting	10x10	28.5	
Fuel Deposit	PressureSide/MidSpan/TE	22500	Fuel Dep	8x8	34.3	
Erosion/Deposit#1	SuctionSide/Tip/TE	?	Deposits	4x4	62.7	
Erosion/Deposit#2	PressureSide/Hub/TE	?	Ero/Dep	1x1	57.7	
<u>STATISTICS IN MICRONS</u>						<u>Surface RMS Angle (Degrees)</u>
	<u>Ra</u>	<u>Rq</u>	<u>Rt</u>	<u>Sk</u>	<u>K</u>	<u><α></u>
Pitted	4.7	7.4	122	-2.53	16.14	7.7
Fuel Deposit	40.7	49.6	296	0.55	2.8	24.7
Erosion/Deposit#1	7	8.9	80	0.33	3.3	24
Erosion/Deposit#2	9	11.2	73.2	0.03	2.98	23.7
<u>Wetted Surface Area /Mean Level Surface</u>						
Pitted	1.016					
Fuel Deposit	1.24					
Erosion/Deposit#1	1.19					
Erosion/Deposit#2	1.199					

The table shows centerline average roughness values of $4.7\text{ }\mu\text{m}$ for the pitted plates, $R_a = 40.7\text{ }\mu\text{m}$ for the fuel deposit panels, $R_a = 7\text{ }\mu\text{m}$ for the erosion/deposit #1 panels, and $R_a = 9\text{ }\mu\text{m}$ for the erosion/deposit #2 panels. At a glance, the fuel deposits appeared to have the most prominent roughness features, as suggested by its R_a value. The two erosion /deposit panels had higher kurtosis levels, however, indicating that the roughness elements contained in the sample had steeper sides. The kurtosis level, when paired with a positive skewness level (measure of roughness element bias above or below the mean surface level), appeared to contribute the greatest amount to skin friction coefficient. The pitted surface had the largest kurtosis because of the sudden steps where TBC coatings had delaminated and chipped away, but its highly negative skewness must counter the effect of the steep walls.

The flat panels were not based upon roughness data from the surface of a turbine blade. Rather, smooth plastic part generation was artificially created through the AutoGen part manufacturing routine. Although the flat panels were a uniform quarter-inch thick, they were not absolutely smooth. The printer extruded plastic in parallel beads and layered them to build the part up from the platen floor. The resultant upper surface contained small corrugations (height of approximately 0.125 mm). Though not perfectly level, the flat plate roughness could be considered hydraulically smooth, and it provided a good reference basis for the other rougher surfaces. A Plexiglas panel was also used as a check for the flat plates during skin friction coefficient measurement.

4.2 Skin Friction Results

Though two methods were used to calculate skin friction coefficient, only the momentum deficit results were used as a reference when making correlations and drawing conclusions about friction coefficient and heat transfer interactions.

4.2.1 Momentum Deficit Procedure Results

Initially, a total of ten velocity profiles were taken at set intervals over the roughness surfaces (five corresponding upstream and downstream locations). Because of their close agreement and the time required for each measurement, the total number of profiles per surface was reduced to six. The three pairs of momentum deficit data were each used to calculate a friction coefficient, and the three c_f values were averaged to give the measured value of the roughness panel. As an example, the calculated flat plate friction coefficients ranged from 3.244×10^{-3} to 3.615×10^{-3} , averaging to $c_f = 3.486 \times 10^{-3}$. The $d\theta$ values for the same flat panels ranged from 0.0438 to 0.0488, and averaged to 0.0471. All measured c_f values are contained in Table 4.2.

Table 4.2 Measured Friction Coefficient Values (Momentum Deficit)

Surface Type	Average c_f	Percent Relative to Flat Plate
Flat Plate	3.486×10^{-3}	100 %
Pitted	5.079×10^{-3}	146 %
Fuel Deposit	7.798×10^{-3}	224 %
Erosion/Deposit #1	7.911×10^{-3}	227 %
Erosion/Deposit #2	8.844×10^{-3}	254 %

Interestingly, the fuel deposit surface had the largest physical roughness elements by inspection. The large, rolling mountains and valleys of the fuel deposits were in stark contrast to the smaller and shorter, but more jagged, elements on the two erosion/deposit panels. A casual observer may have guessed that the larger elements of the fuel deposits

would create a greater momentum deficit, but the opposite was true. The steepness of the erosion/deposit elements must factor greatly into the disruption of the boundary layer over the surface.

The friction coefficient data can also be checked against known turbulent boundary layer Re correlations. In Schlichting (1979), we find several possible correlations, including Prandtl, Prandtl-Schlichting, Schultz-Grunow, and Nikuradse (used below) (Schlichting, 1979:639). Each of these correlations was empirically calculated for turbulent boundary layer flow over a smooth flat plate at zero incidence angle.

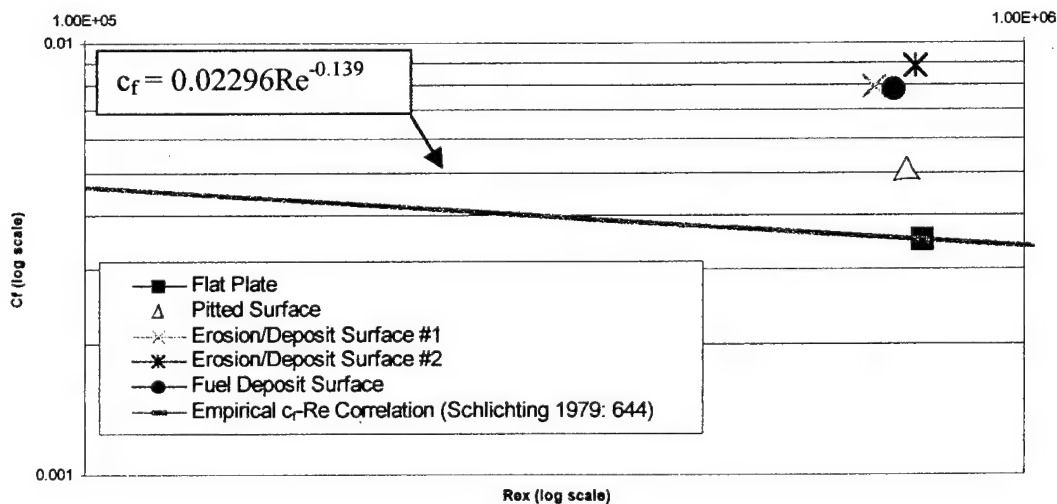


Figure 4.1 c_f – Re Correlation

The flat plate stayed very near to the turbulent flow empirical c_f – Re correlation found in Schlichting and plotted as the line in Figure 4.1. The rougher panels, as expected, fell above the correlation curve.

Figures 4.2 and 4.3 show plots of the upstream and downstream velocity profiles. It is easy to surmise that, since the upstream profiles were taken at about the same

streamwise location for all roughness coupons, the shape of the downstream velocity profile drives the momentum deficit. Note that the upstream profiles are nearly indistinguishable from each other, while the downstream profiles show obvious disparities owing to the higher shear drag on the rougher test articles.

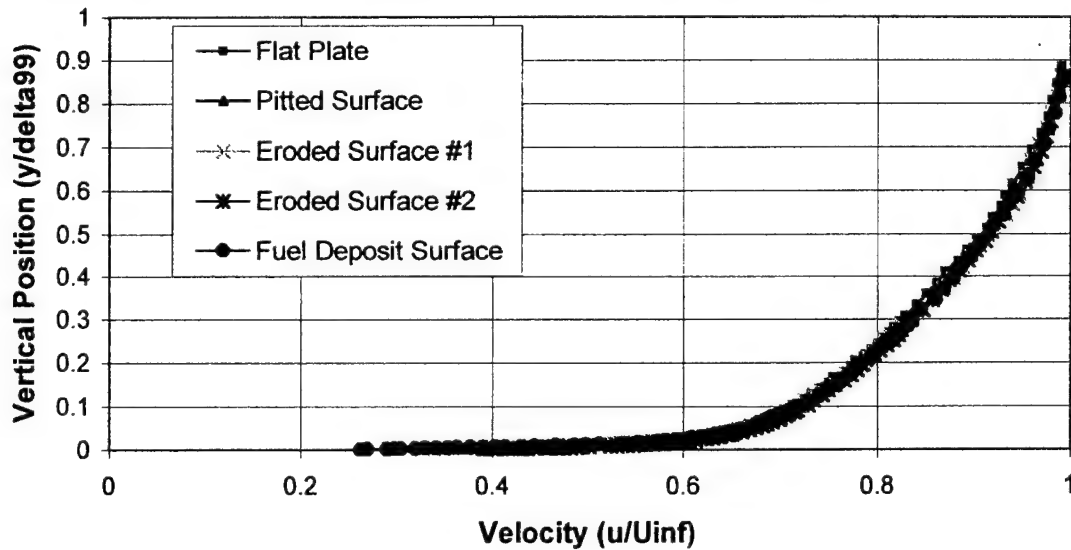


Figure 4.2 Leading Edge Velocity Profiles

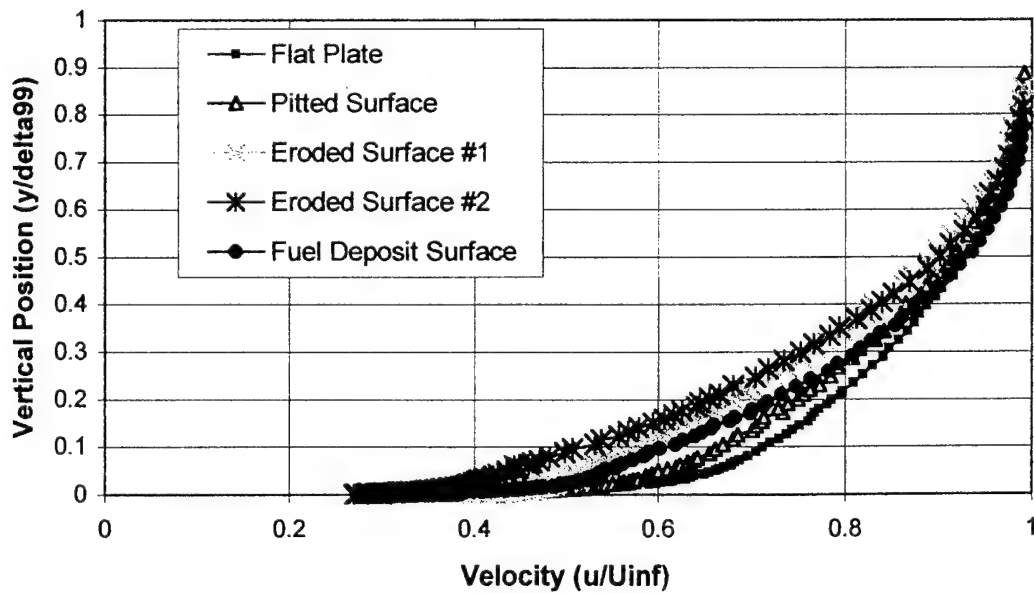


Figure 4.3 Trailing Edge Velocity Profiles

4.2.2 Bulk Drag Procedure Results

The bulk measurements were attempted with both a spring attached to the aluminum plate to resist downstream movement, and no spring attached. The spring was used in case the displacement of the plate tended to travel outside of the linear range of the LVDT. After testing, however, it was determined that the plate assembly itself had enough of an inherent spring constant to resist the motion of the roughness panels under the influence of the air flow. Thus the numbers reported herein are from the springless system. Please refer to Table 4.3 for the bulk measurement results.

Table 4.3 Measured Friction Coefficient Values (Bulk Drag)

Surface Type	Average displacement (mm)	Percent Relative to Flat Plate
Flat Plate	0.29	100 %
Pitted	0.51	176 %
Fuel Deposit	0.87	300 %
Erosion/Deposit #1	0.89	307 %
Erosion/Deposit #2	1.03	355 %

Note that the pitted plate data shows about the same percentage difference as the momentum deficit measurements, but the fuel deposit and erosion/deposit panels indicate a larger increase than the momentum results. Due to the difficulty involved with controlling the experiment, the bulk measurement results are more spurious than the pitot results. As alluded to earlier, the temperature played a large role in the displacement of the plates. Although the means was not fully understood—likely due to the thermal expansion of the thin support wire—it was found that the displacement could vary by 50% if the freestream temperature was not well controlled. The first reading was always taken while the tunnel was turned off, and the displacement was measured with one

blower on. The temperature typically increased by 33% when one blower was turned on since the air intake for the blowers was inside the large bay which housed the tunnel. Thus the ducting drew the air in, added energy via the blowers, then forced it through the tunnel back into the room where it could revisit the process. The use of two blowers exacerbated the situation. Although the tunnel was first operated for about 20 minutes to warm it up before starting the test, it was very conceivable that errors crept in as the temperature rose or fell.

Additionally, though care was taken to hang the plates from the overhead rig, there might not have been equal tension in each of the four support wires. If the wires did not see identical loads at the start of the test, the plates may have pushed back unevenly. The LVDT was attached to one side of the aluminum plate, so asymmetric displacement of the plate would give an erroneous result. In all, a 20% variation in the bulk drag results was encountered, compared to about 5% for the momentum deficit results. A comparison of the c_f results from both the momentum deficit and bulk drag measurements is presented in Figure 4.4. Note that both methods show similar trends in the skin friction data, but the bulk drag method seems to be high by a multiplier.

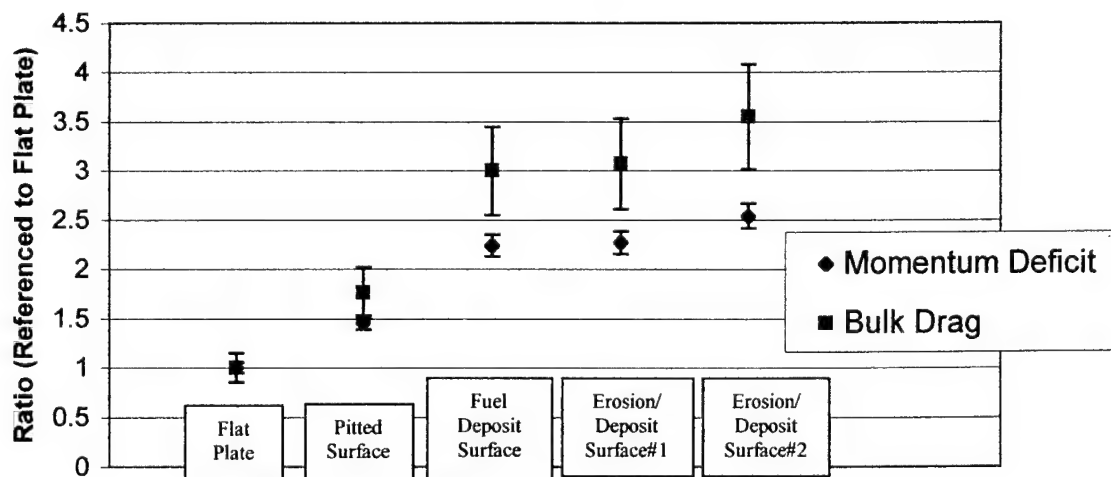


Figure 4.4 Momentum Deficit vs. Bulk Drag Results

4.3 Heat Transfer Results

A transient method was used to find the approximate convective heat transfer coefficient for each roughness surface. Once the raw temperature data was extracted from the IR camera images, Schultz and Jones' (1973) heat transfer analysis was used to find h values at each time step. The algorithm was coded in Mathcad, as shown for the fuel deposit surface in Figure 4.5

Fuel panels, 1 blower 08 Feb 01

Thermal diffusivity	$\alpha := 0.000000058 \quad \text{m}^2/\text{s}$
Thermal conductivity	$k := .226 \quad \text{W}/\text{mK}$
Prandtl number (for air)	$Pr := 0.78$
Distance from splitter plate to temp measurement area	$x := .9652 \quad \text{m}$
Specific (heat for air)	$C_p := 1044.5 \quad \text{J}/\text{kgK}$
Density of air	$\rho := 1.009 \quad \text{kg}/\text{m}^3$
Velocity of flow	$U_{inf} := 12.2 \quad \text{m}/\text{s}$
Temperature of airflow	$T_{inf} := 335.8 \quad \text{K}$
Total number of data points	$N := 120$
	$i := 1, 2 \dots N$

$$q_i := \frac{2k}{\sqrt{\pi \cdot \alpha}} \cdot \sum_{j=1}^i \frac{(T_j - T_{j-1})}{\sqrt{t_i - t_j} + \sqrt{t_i - t_{j-1}}} \quad h_i := \frac{q_i}{T_{inf} - T_i}$$

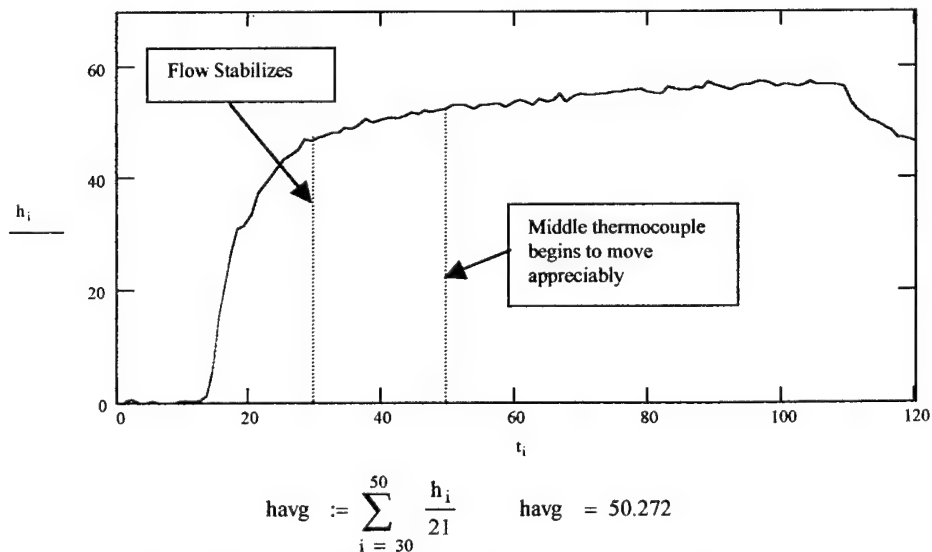


Figure 4.5 Sample Mathcad h Calculation Algorithm

These h values could then be used to find Stanton number, which was subsequently plotted versus Reynolds number, as shown in Figure 4.6. Convective heat transfer coefficients were plotted between the time necessary for freestream temperature to climb to its steady value (about 30 seconds) to the time that the thermal wave reached the bottom of the plastic panel (about 50 seconds).

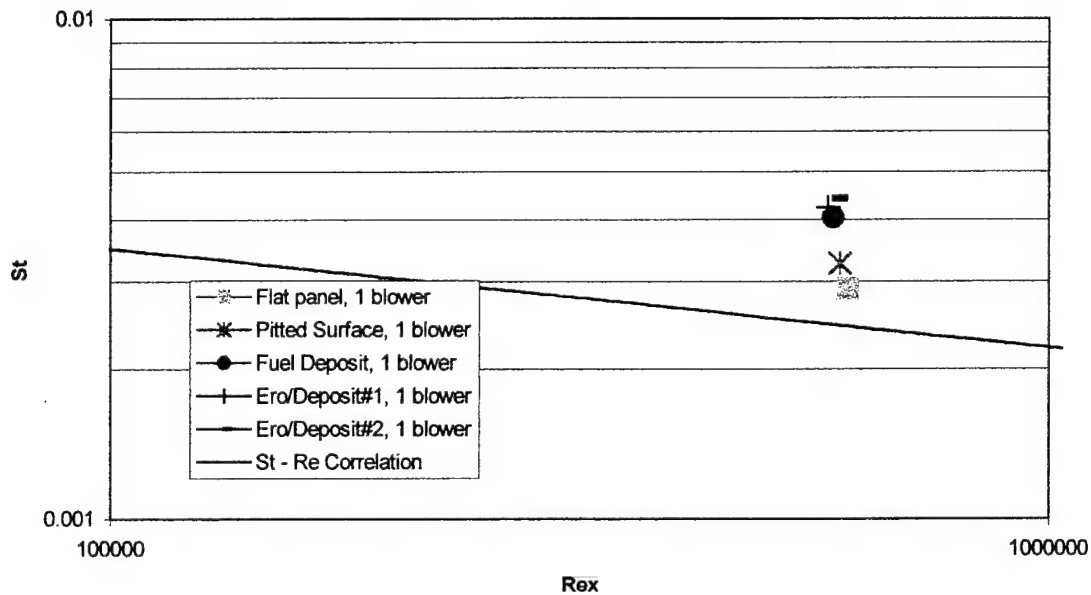


Figure 4.6 Stanton Number vs. Reynolds Number Correlations

While the c_f - Re correlation for the flat plate case fell within 1% of the predicted value, the predicted heat transfer correlation for the same flat panels underestimated the actual convective heat transfer by about 14%. The correlation used was Equation (31)

from Chapter 2: $St_x = 0.0296 Re_x^{-\frac{1}{5}} Pr^{-\frac{2}{3}}$. Other empirical and analytical correlations may

raise or lower the predicted value by about 12%, so the mild underestimation was not a cause for concern. The more telling information in Figure 4.6 lies with the relative convective heat transfer between the various plates. The progression of increasing heat

transfer remains the same as the trend for increasing c_f . In other words, the erosion/deposit #2 panels had the highest c_f as well as the highest heat transfer coefficient, and the other panels rank accordingly. The difference is not in the trend, as shown in Table 4.4, but with the percentage increase for each panel referenced to the flat panels.

Table 4.4 Comparison of Percent Increase in Shear Drag and Convective Heat Transfer

Surface Type	Percent c_f Relative to Flat Plate	Percent h Relative to Flat Plate
Flat Plate	100 %	100 %
Pitted	146 %	114 %
Fuel Deposit	224 %	139 %
Erosion/Deposit #1	227 %	146 %
Erosion/Deposit #2	254 %	154 %

As explained in Chapter 2 (Equation 29), friction coefficient and convective heat transfer coefficient are linearly related for a uniformly rough flat plate in turbulent boundary layer flow. Thus one would expect that an increase in c_f would result in an equivalent percent increase in h . These experimental results indicate otherwise for real turbine surface roughness.

4.4 Skin Friction and Heat Transfer Correlations

Analysis of the results from experimental friction and heat transfer experiments indicates that, though friction coefficient may dramatically increase due to erosion or various types of deposits, heat transfer rate may not increase by a comparative amount. The depressed augmentation in heat transfer likely stems from the similarity between uniform sandgrain roughness and the dimples from Kithcart and Klett's 1997 research. They found that heat transfer rate remained nearly the same though c_f underwent a 40%

decrease from hemispherical bumps to hemispherical dimples. This knowledge suggests that c_f may drastically increase for real turbine roughness (highly dependent upon the steepness of the roughness elements) but heat transfer rate does not experience the same level of augmentation.

Bogard et al. (1996) asserted that centerline average roughness alone was not sufficient for the estimation of heat transfer over a rough surface. Rather, a procedure was suggested that converted R_a to equivalent sandgrain roughness, k_s , with the aid of a shape density parameter, Λ_s . Λ_s was defined as $(S/S_f)(A_s/A_f)^{1.6}$, where

S/S_f is the ratio of the (planform) surface area without roughness to the total frontal area of the roughness elements, A_f is the frontal area of an element, and A_s is the windward wetted surface area of an element (Bogard et al. 1996).

Λ_s estimated the size, shape, and number density of the roughness elements and provided a correction factor to account for the tenuous conversion of $k_s = 1.6 \cdot k$ suggested by A. D. Young in 1950 (Young, 1950). Bogard et al. began with the surface roughness parameters R_a , Λ_s , and k , where k was assumed to be equal to the mean surface roughness, R_z . Empirical correlations between k_s/k and Λ_s accomplished by Sigal and Danberg (1990), Hosni et al. (1991), and Coleman et al. (1992) were then used to estimate k_s . Then k_s was used in White's sandgrain roughness correlation for fully rough flows: $c_f = (1.4 + 3.7 \log(0.9625/k_s))^{-2}$ (1974) to estimate c_f . Finally St was calculated from c_f using the relation (Bogard, 1996:6):

$$St = \frac{c_f}{2} (Pr_t + \sqrt{\frac{c_f}{2}} (C Re_{k_s}^{-0.2} Pr^{-0.4})^{-1})^{-1} \quad (39)$$

As a check, Bogard's analysis was recreated for the pitted, fuel deposit, and erosion/deposit panel data obtained in this study, and the comparative results are shown in Figure 4.7.

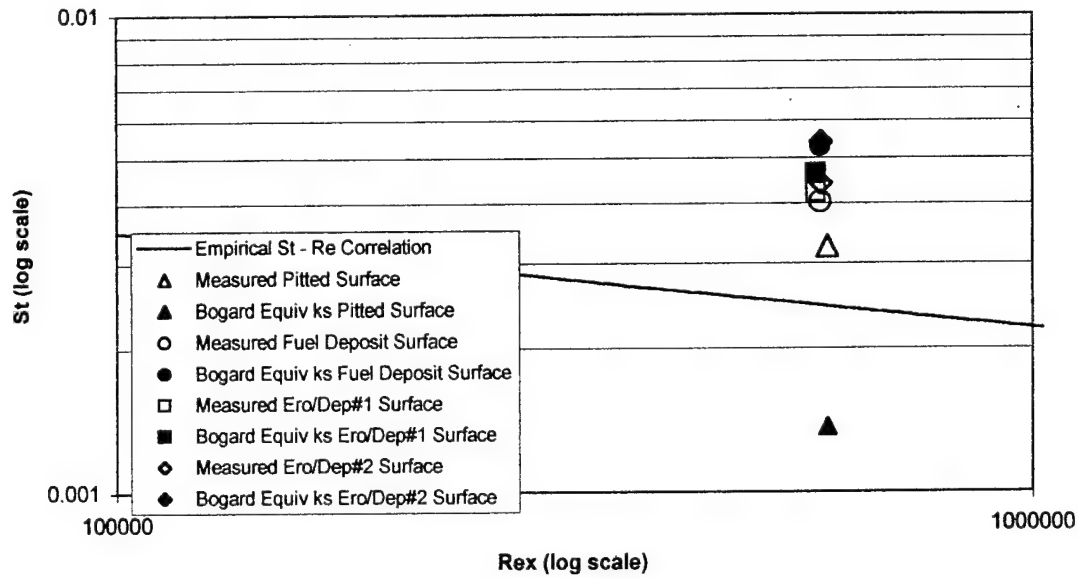


Figure 4.7 Comparative Analysis of Bogard et al. Method to Experimental Results

Figure 4.7 shows that the Stanton numbers predicted by Bogard fall slightly higher (between 10% and 31% more) than the Stanton numbers obtained through experiment for the fuel deposit and erosion/deposit surfaces. One would expect that the calculated equivalent sandgrain roughness should boost the heat transfer, and it does in these cases. The equivalent sandgrain roughness calculated for the pitted surface, however, severely underestimates the heat transfer rate by 58%. The difficulty lies not with the calculation of heat transfer from the equivalent k_s . Rather, the difference in Stanton numbers derives from the severe underestimation of c_f based on k_s . The discrepancy likely stems from Bogard's use of Frank M. White's (1974) equation: $c_f =$

$(1.4 + 3.7\log(0.9625/k_s))^{-2}$ for fully rough flows. Due to the sporadically dispersed nature of the pitted roughness elements, flow over the surface may not accurately be described as fully rough. Thus the k_s -to- c_f conversion breaks down for the pitted surface.

This analysis indicates that Bogard's Stanton number prediction method, using the shape density parameter correction to estimate c_f , is fairly accurate for surfaces with more evenly distributed roughness elements. However, the method has trouble with surfaces containing highly irregular and sporadically distributed roughness elements, such as the pitted surface.

The results presented in this chapter do correspond well to the relative augmentation results presented by Kithcart and Klett (1997). Kithcart and Klett define efficiency factor, $\eta = (St/Flat\ Plate\ Reference\ St)/(c_f/Flat\ Plate\ Reference\ c_f)$. They found for test panels with hemispherical dimples that $\eta = 0.8 \sim 0.9$, while $\eta = 0.5 \sim 0.6$ for test panels with hemispherical bumps. For comparison, it is reasonable to match the dimples to the pitted surface used in this study; and to match the bumps to the fuel deposit and erosion/deposit surfaces. Table 4.5 shows how closely these efficiency factor numbers correlate.

Table 4.5 Stanton Number Augmentation vs. Skin Friction Augmentation

	cf	St	$\frac{(cf/cfo)}{(St/Sto)}$	$\frac{(St/Sto)}{(cf/cfo)}$		
Flat Plate	0.003486	0.002891	1	1		
Pitted Surface	0.005079	0.003256	1.293727	0.772961		
Fuel Deposit Surface	0.007798	0.004032	1.603668	0.62357		
Erosion/Deposit #1	0.007911	0.004222	1.553973	0.643512	—	Avg 0.622714
Erosion/Deposit #2	0.008844	0.004408	1.663725	0.601061		StDev 0.021238

The implication of these similar results is that surfaces of different roughness types may have similar Stanton number augmentation to skin friction augmentation ratios if they share similar skewnesses. Surfaces with predominantly sunken roughness elements (negative skewness) may tend toward a higher η , while surfaces with primarily raised roughness elements (positive skewness) may have a lower η . Of course, the lower η does not indicate that the St and c_f levels are less than that of the negative skewness surface, but only that the augmentation ratio is less.

V. Conclusions and Recommendations

5.1 Reflections on Obtained Data

The study of turbine component roughness and its associated shear drag and convective heat transfer characteristics is important to increasing turbine component lifespan and even increasing overall engine efficiency by characterizing how much turbine surface degradation can cost the engine performance. This work used real turbine blade surface roughness in an effort to understand skin friction and heat transfer interactions on in-service turbine blades. Referenced to a flat plate, data indicates that pitted/chipped surfaces exhibit modest increases in both friction coefficient and heat transfer rate. Fuel deposits and erosion/deposit surfaces increase c_f by about 230%, and convective heat transfer rate climbs approximately 145%. Current skin friction and heat transfer correlations predict equal augmentation. The discrepancy between friction coefficient increase and convective heat transfer coefficient increase appears to be related to the steepness of the roughness elements and to the positive bias (skewness) of the largest roughness elements.

5.2 Conclusions

Real turbine blade surfaces were used to generate roughness statistics, friction coefficients, and heat transfer data. Present shear stress/convective heat transfer correlations, based upon numerical analysis and empirical observations for sandgrain-type roughness, appear inadequate for predicting heat transfer based on skin friction coefficient. Furthermore, roughness statistics from each sample do little to aid in the

prediction of skin friction coefficient. Thus using roughness statistics to determine heat transfer rates over a turbine surface would seem difficult at best.

As described in the analysis section, roughness statistics give insight into the size, steepness, and vertical height distribution of the roughness elements for a given surface. R_a is typically used as a measure of the surface roughness, but, as suggested by Bogard et al. (1996), R_a alone is an insufficient predictor of c_f . Skewness, Sk , (a measure of roughness bias above or below the mean surface level normalized by the rms roughness), kurtosis, Ku , (a measure of roughness element steepness normalized by the rms roughness), and average roughness slope, $\langle\alpha\rangle$ (an angle measurement of roughness element steepness) appear to play larger roles in the determination of friction coefficient than the centerline average roughness.

Even if a perfect empirical correlation could be found between roughness statistics and skin friction coefficient, heat transfer predictions based on Reynolds analogy would be slightly off. The interaction of peaks and valleys on a typical turbine blade drastically increase the friction coefficient, while raising heat transfer rates a lesser amount. As reported by Kithcart and Klett (1997), the peaks tend to contribute far more shear drag than the valleys of a rough surface; yet the peaks maintain a convective heat transfer rate similar to that of the valleys. When compared to a uniform sandgrain-type rough surface, then, a real turbine blade has a greatly increased c_f for an equivalent heat transfer rate. Conversely, the real turbine blade will have a depressed heat transfer rate for an equivalent sandgrain roughness friction coefficient.

5.3 Recommendations

Due to time constraints, several experimental variations were hypothesized but abandoned. One interesting study involves the influence of the roughness valleys on the roughness data. With the existing Talysurf Ultra software and Stratasys Inc. Genisys Xs plastic printer, it would be possible to print two identical roughness coupons, with one's roughness elements all above the mean line of the flat surface, and the other's roughness elements below the mean line of the surface, as shown in Figure 5.1. This study would show the relative effect of the roughness elements which are deposited versus those elements that result from the deterioration and erosion of the turbine surface. In a similar study, a roughened surface may be reprinted with only its mountains and then only its valleys, as shown in Figure 5.2.

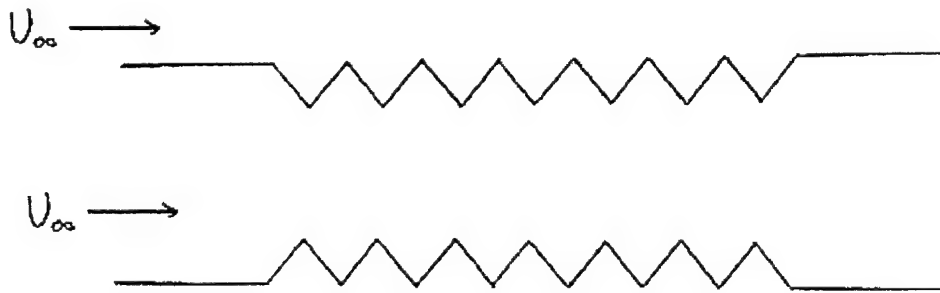


Figure 5.1 Recommendation for Future Study #1

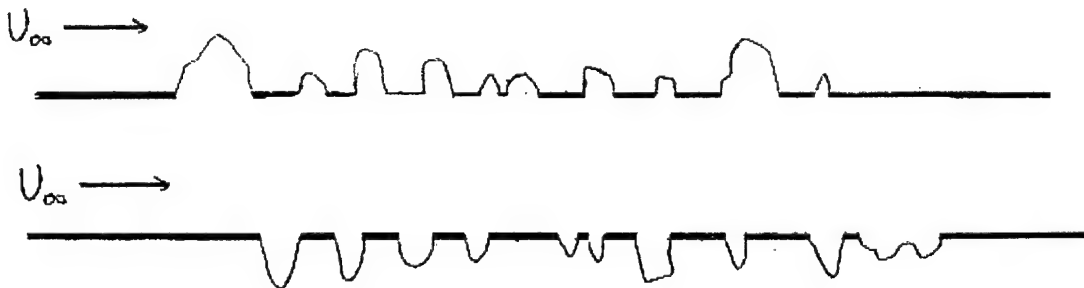


Figure 5.2 Recommendation for Future Study #2

The research conducted in this study ignored the effect of pressure gradients over a turbine blade. Indeed pressure gradients are present within a turbine, and retaking c_f and h measurements with induced pressure gradients would add to the understanding of shear drag and heat transfer on an in-service turbine blade. Additionally, flow exiting a combustor and passing through a turbine can be considered fully turbulent. For the collection of the preceding data, only the boundary layer was tripped to produce a fully turbulent boundary layer. The freestream velocity was not turbulent. Further study could include the effects of fully turbulent flow by injecting asymmetrical air pulses upstream of the test articles.

APPENDIX A

Flat Panel Skin Friction Data

9/29/00 3:39 PM 1
 Rel Humidi 27
 y (cm) Vmean (m) T (degK) DP ("H2O) density (kg Patm ("Hg) viscosity (kg/ms)

0.001	4.16052	289.9088	0.04149	1.1942	29.401	1.80E-05
0.0015	4.13828	289.8718	0.04106	1.1943	29.401	1.80E-05
0.0025	4.09968	289.9108	0.04029	1.1942	29.401	1.80E-05
0.0035	4.09858	289.8812	0.04027	1.1943	29.401	1.80E-05
0.004	4.08997	289.8882	0.0401	1.1943	29.401	1.80E-05
0.005	4.11041	289.8909	0.0405	1.1943	29.401	1.80E-05
0.006	4.12999	289.879	0.04089	1.1943	29.401	1.80E-05
0.007	4.19046	289.8952	0.04209	1.1942	29.401	1.80E-05
0.008	4.241	289.887	0.04312	1.1943	29.401	1.80E-05
0.0095	4.29498	289.8985	0.04422	1.1942	29.401	1.80E-05
0.0105	4.4609	289.8907	0.0477	1.1943	29.401	1.80E-05
0.0115	4.53899	289.9028	0.04939	1.1942	29.401	1.80E-05
0.012	4.58977	289.9112	0.05049	1.1942	29.401	1.80E-05
0.013	4.70302	289.8714	0.05303	1.1944	29.401	1.80E-05
0.014	4.77497	289.903	0.05465	1.1942	29.401	1.80E-05
0.015	4.86179	289.8952	0.05666	1.1942	29.401	1.80E-05
0.0175	5.04749	289.8878	0.06107	1.1943	29.401	1.80E-05
0.02	5.23888	289.8597	0.0658	1.1944	29.401	1.80E-05
0.022	5.37491	289.8925	0.06925	1.1943	29.401	1.80E-05
0.0235	5.59613	289.8664	0.07508	1.1944	29.401	1.80E-05
0.025	5.72599	289.8652	0.0786	1.1944	29.401	1.80E-05
0.0275	5.87562	289.8658	0.08276	1.1944	29.401	1.80E-05
0.0295	5.97069	289.8714	0.08546	1.1944	29.401	1.80E-05
0.0315	6.11291	289.8683	0.08958	1.1944	29.401	1.80E-05
0.0335	6.19743	289.8679	0.09208	1.1944	29.401	1.80E-05
0.035	6.36068	289.881	0.09699	1.1943	29.401	1.80E-05
0.0375	6.39362	289.8551	0.098	1.1944	29.401	1.80E-05
0.04	6.51967	289.8576	0.10191	1.1944	29.401	1.80E-05
0.0415	6.60149	289.82	0.10449	1.1946	29.401	1.80E-05
0.0435	6.68033	289.8305	0.107	1.1945	29.401	1.80E-05
0.045	6.65511	289.867	0.10618	1.1944	29.401	1.80E-05
0.047	6.80103	289.8603	0.11089	1.1944	29.401	1.80E-05
0.0495	6.93763	289.8666	0.11539	1.1944	29.401	1.80E-05
0.054	7.03376	289.8796	0.1186	1.1943	29.401	1.80E-05
0.06	7.1747	289.8806	0.1234	1.1943	29.401	1.80E-05
0.0645	7.3244	289.8806	0.1286	1.1943	29.401	1.80E-05
0.0695	7.34061	289.8896	0.12917	1.1943	29.401	1.80E-05
0.074	7.44622	289.8679	0.13292	1.1944	29.401	1.80E-05
0.08	7.53097	289.8753	0.13596	1.1943	29.401	1.80E-05
0.084	7.59114	289.8915	0.13814	1.1943	29.401	1.80E-05
0.0895	7.69528	289.8747	0.14196	1.1943	29.401	1.80E-05
0.094	7.74598	289.8931	0.14383	1.1943	29.401	1.80E-05
0.1	7.79439	289.9016	0.14563	1.1942	29.401	1.80E-05
0.1095	7.93065	289.8827	0.15077	1.1943	29.401	1.80E-05
0.1195	7.99341	289.8952	0.15316	1.1942	29.401	1.80E-05
0.1295	8.03071	289.909	0.15459	1.1942	29.401	1.80E-05
0.1395	8.08925	289.9147	0.15685	1.1942	29.401	1.80E-05
0.149	8.2107	289.9318	0.16158	1.1941	29.401	1.80E-05
0.1595	8.21446	289.8923	0.16175	1.1943	29.401	1.80E-05
0.169	8.28586	289.9079	0.16457	1.1942	29.401	1.80E-05
0.1795	8.33204	289.9237	0.1664	1.1941	29.401	1.80E-05
0.189	8.40014	289.9085	0.16914	1.1942	29.401	1.80E-05
0.199	8.43577	289.9198	0.17057	1.1941	29.401	1.80E-05
0.2235	8.56435	289.897	0.17582	1.1942	29.401	1.80E-05
0.2485	8.66667	289.9061	0.18004	1.1942	29.401	1.80E-05

0.2735	8.79159	289.9143	0.18527	1.1942	29.401	1.80E-05
0.2985	8.87302	289.9205	0.18871	1.1941	29.401	1.80E-05
0.323	8.92275	289.9342	0.19082	1.1941	29.401	1.80E-05
0.348	9.09143	289.9272	0.19811	1.1941	29.401	1.80E-05
0.373	9.14429	289.9114	0.20043	1.1942	29.401	1.80E-05
0.398	9.19491	289.9172	0.20265	1.1942	29.401	1.80E-05
0.423	9.32031	289.9203	0.20822	1.1941	29.401	1.80E-05
0.4475	9.39777	289.9377	0.21168	1.1941	29.401	1.80E-05
0.4725	9.48193	289.9221	0.2155	1.1941	29.401	1.80E-05
0.497	9.55527	289.9186	0.21885	1.1941	29.401	1.80E-05
0.5225	9.61123	289.8956	0.22144	1.1942	29.401	1.80E-05
0.5465	9.67222	289.8753	0.22427	1.1943	29.401	1.80E-05
0.572	9.73841	289.859	0.22736	1.1944	29.401	1.80E-05
0.597	9.80653	289.865	0.23055	1.1944	29.401	1.80E-05
0.646	9.94898	289.858	0.2373	1.1944	29.401	1.80E-05
0.696	10.06856	289.8699	0.24303	1.1944	29.401	1.80E-05
0.746	10.19837	289.8611	0.24935	1.1944	29.401	1.80E-05
0.7955	10.3003	289.8535	0.25436	1.1944	29.401	1.80E-05
0.8455	10.45033	289.889	0.26179	1.1943	29.401	1.80E-05
0.895	10.56329	289.8771	0.2675	1.1943	29.401	1.80E-05
0.945	10.68216	289.881	0.27355	1.1943	29.401	1.80E-05
0.995	10.80036	289.8747	0.27964	1.1943	29.401	1.80E-05
1.0445	10.88159	289.8562	0.28388	1.1944	29.401	1.80E-05
1.094	10.99239	289.8781	0.28967	1.1943	29.401	1.80E-05
1.144	11.03423	289.858	0.2919	1.1944	29.401	1.80E-05
1.1935	11.1213	289.8753	0.29651	1.1943	29.401	1.80E-05
1.2685	11.24823	289.8679	0.30332	1.1944	29.401	1.80E-05
1.3435	11.35348	289.8664	0.30903	1.1944	29.401	1.80E-05
1.418	11.47068	289.867	0.31544	1.1944	29.401	1.80E-05
1.4925	11.55796	289.888	0.32023	1.1943	29.401	1.80E-05
1.567	11.60531	289.8625	0.32289	1.1944	29.401	1.80E-05
1.642	11.66493	289.8699	0.32621	1.1944	29.401	1.80E-05
1.7165	11.71816	289.8958	0.32916	1.1942	29.401	1.80E-05
1.7915	11.74265	289.8905	0.33055	1.1943	29.401	1.80E-05
1.866	11.76673	289.897	0.33189	1.1942	29.401	1.80E-05
1.9415	11.78753	289.8837	0.33308	1.1943	29.401	1.80E-05
2.016	11.7884	289.8901	0.33313	1.1943	29.401	1.80E-05
2.0915	11.7928	289.8765	0.33339	1.1943	29.401	1.80E-05
2.166	11.79704	289.8997	0.3336	1.1942	29.401	1.80E-05
2.242	11.81368	289.9149	0.33453	1.1942	29.401	1.80E-05
2.316	11.81251	289.9274	0.33445	1.1941	29.401	1.80E-05
2.3915	11.8185	289.8964	0.33482	1.1942	29.401	1.80E-05
2.466	11.81436	289.9147	0.33457	1.1942	29.401	1.80E-05
2.5415	11.8269	289.9194	0.33527	1.1941	29.401	1.80E-05
2.616	11.81654	289.9359	0.33466	1.1941	29.401	1.80E-05
2.6915	11.82259	289.9494	0.33499	1.194	29.401	1.80E-05
2.766	11.83012	289.9392	0.33543	1.1941	29.401	1.80E-05
2.8415	11.84567	289.9233	0.33633	1.1941	29.401	1.80E-05
2.916	11.8353	289.9293	0.33574	1.1941	29.401	1.80E-05
2.991	11.84872	289.9414	0.33648	1.1941	29.401	1.80E-05
3.091	11.8443	289.9196	0.33626	1.1941	29.401	1.80E-05
3.191	11.8511	289.9558	0.3366	1.194	29.401	1.80E-05
3.291	11.84859	289.9494	0.33647	1.194	29.401	1.80E-05
3.391	11.84934	289.9192	0.33654	1.1941	29.401	1.80E-05
3.491	11.85548	289.9192	0.33689	1.1941	29.401	1.80E-05
3.591	11.86941	289.942	0.33766	1.194	29.401	1.80E-05
3.691	11.85632	289.9338	0.33692	1.1941	29.401	1.80E-05
3.791	11.85053	289.9207	0.33661	1.1941	29.401	1.80E-05

9/29/00	4:56 PM	2				
Rel Humidi	27					
y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.0005	3.83869	289.7362	0.03534	1.1949	29.401	1.80E-05
0.0015	3.87465	289.6912	0.03601	1.1951	29.401	1.80E-05
0.0025	3.82072	289.684	0.03502	1.1952	29.401	1.80E-05
0.003	3.93954	289.6923	0.03723	1.1951	29.401	1.80E-05
0.004	4.03204	289.7189	0.039	1.195	29.401	1.80E-05
0.005	4.12101	289.684	0.04074	1.1952	29.401	1.80E-05
0.006	4.29419	289.7095	0.04423	1.195	29.401	1.80E-05
0.007	4.3699	289.684	0.04581	1.1952	29.401	1.80E-05
0.0085	4.44722	289.7052	0.04744	1.1951	29.401	1.80E-05
0.0095	4.56863	289.6762	0.05007	1.1952	29.401	1.80E-05
0.0105	4.66586	289.7265	0.05222	1.195	29.401	1.80E-05
0.0115	4.81049	289.6962	0.05551	1.1951	29.401	1.80E-05
0.0125	4.91616	289.6896	0.05798	1.1951	29.401	1.80E-05
0.0135	4.94252	289.7017	0.0586	1.1951	29.401	1.80E-05
0.014	5.02426	289.6918	0.06056	1.1951	29.401	1.80E-05
0.015	5.12431	289.6945	0.06299	1.1951	29.401	1.80E-05
0.017	5.25625	289.7194	0.06627	1.195	29.401	1.80E-05
0.0195	5.47566	289.7167	0.07192	1.195	29.401	1.80E-05
0.0215	5.60637	289.735	0.07539	1.1949	29.401	1.80E-05
0.0235	5.62895	289.7331	0.076	1.1949	29.401	1.80E-05
0.025	5.8479	289.7023	0.08203	1.1951	29.401	1.80E-05
0.0275	5.93461	289.7015	0.08448	1.1951	29.401	1.80E-05
0.03	6.02167	289.7171	0.08698	1.195	29.401	1.80E-05
0.032	6.11996	289.7132	0.08984	1.195	29.401	1.80E-05
0.0335	6.26649	289.7249	0.09419	1.195	29.401	1.80E-05
0.035	6.28718	289.743	0.09481	1.1949	29.401	1.80E-05
0.037	6.36318	289.7574	0.09711	1.1948	29.401	1.80E-05
0.0395	6.43953	289.7124	0.09947	1.195	29.401	1.80E-05
0.0415	6.51113	289.7165	0.10169	1.195	29.401	1.80E-05
0.043	6.5648	289.6912	0.10338	1.1951	29.401	1.80E-05
0.045	6.63638	289.7163	0.10564	1.195	29.401	1.80E-05
0.047	6.69611	289.6807	0.10756	1.1952	29.401	1.80E-05
0.0495	6.70023	289.6867	0.10769	1.1951	29.401	1.80E-05
0.054	6.76715	289.6807	0.10986	1.1952	29.401	1.80E-05
0.0595	6.91834	289.6504	0.11484	1.1953	29.401	1.80E-05
0.064	7.00778	289.6676	0.11782	1.1952	29.401	1.80E-05
0.0695	7.07813	289.6738	0.12019	1.1952	29.401	1.80E-05
0.074	7.18193	289.6428	0.12376	1.1953	29.401	1.80E-05
0.0795	7.2159	289.651	0.12493	1.1953	29.401	1.80E-05
0.084	7.26426	289.6534	0.1266	1.1953	29.401	1.80E-05
0.0895	7.38202	289.6666	0.13074	1.1952	29.401	1.80E-05
0.094	7.38438	289.6423	0.13083	1.1953	29.401	1.80E-05
0.0995	7.45108	289.6321	0.13321	1.1954	29.401	1.80E-05
0.1095	7.49008	289.6082	0.13462	1.1955	29.401	1.80E-05
0.119	7.61373	289.6134	0.1391	1.1955	29.401	1.80E-05
0.1295	7.67317	289.6173	0.14128	1.1954	29.401	1.80E-05
0.139	7.7584	289.6374	0.14442	1.1954	29.401	1.80E-05
0.1495	7.80989	289.6009	0.14637	1.1955	29.401	1.80E-05
0.159	7.86314	289.6006	0.14837	1.1955	29.401	1.80E-05
0.1695	7.95549	289.5996	0.15187	1.1955	29.401	1.80E-05
0.179	7.94319	289.5949	0.15141	1.1955	29.401	1.80E-05
0.1895	8.00425	289.5891	0.15375	1.1956	29.401	1.80E-05
0.199	8.05613	289.5875	0.15575	1.1956	29.401	1.80E-05
0.2235	8.15992	289.5834	0.15979	1.1956	29.401	1.80E-05
0.249	8.26407	289.5955	0.16389	1.1955	29.401	1.80E-05

0.2735	8.34893	289.6004	0.16727	1.1955	29.401	1.80E-05
0.2985	8.43928	289.5976	0.17091	1.1955	29.401	1.80E-05
0.3235	8.55	289.6117	0.17541	1.1955	29.401	1.80E-05
0.3485	8.64784	289.5935	0.17946	1.1955	29.401	1.80E-05
0.3735	8.72115	289.6302	0.1825	1.1954	29.401	1.80E-05
0.398	8.8113	289.6058	0.1863	1.1955	29.401	1.80E-05
0.423	8.91766	289.599	0.19083	1.1955	29.401	1.80E-05
0.448	8.96027	289.598	0.19266	1.1955	29.401	1.80E-05
0.473	8.99836	289.5805	0.19432	1.1956	29.401	1.80E-05
0.4975	9.05708	289.6013	0.19685	1.1955	29.401	1.80E-05
0.523	9.16244	289.6407	0.20142	1.1953	29.401	1.80E-05
0.548	9.20699	289.6161	0.2034	1.1954	29.401	1.80E-05
0.573	9.32623	289.6121	0.20871	1.1955	29.401	1.80E-05
0.5975	9.34961	289.6066	0.20976	1.1955	29.401	1.80E-05
0.6475	9.48568	289.6105	0.21591	1.1955	29.401	1.80E-05
0.697	9.61156	289.6288	0.22166	1.1954	29.401	1.80E-05
0.747	9.73072	289.628	0.22719	1.1954	29.401	1.80E-05
0.797	9.86659	289.5834	0.23362	1.1956	29.401	1.80E-05
0.847	9.93695	289.6224	0.23693	1.1954	29.401	1.80E-05
0.8965	10.05298	289.5976	0.24252	1.1955	29.401	1.80E-05
0.9465	10.16754	289.5892	0.24808	1.1956	29.401	1.80E-05
0.9965	10.25745	289.6126	0.25247	1.1955	29.401	1.80E-05
1.046	10.31676	289.5779	0.25543	1.1956	29.401	1.80E-05
1.096	10.40712	289.592	0.25991	1.1955	29.401	1.80E-05
1.146	10.51884	289.5791	0.26553	1.1956	29.401	1.80E-05
1.1955	10.6002	289.569	0.26967	1.1956	29.401	1.80E-05
1.2715	10.74445	289.5612	0.27706	1.1957	29.401	1.80E-05
1.345	10.84452	289.5752	0.28223	1.1956	29.401	1.80E-05
1.4205	10.95801	289.5705	0.28818	1.1956	29.401	1.80E-05
1.4945	11.04459	289.5645	0.29276	1.1957	29.401	1.80E-05
1.57	11.17288	289.6	0.29956	1.1955	29.401	1.80E-05
1.644	11.26676	289.591	0.30462	1.1956	29.401	1.80E-05
1.719	11.29291	289.5581	0.30607	1.1957	29.401	1.80E-05
1.794	11.40524	289.5653	0.31219	1.1957	29.401	1.80E-05
1.869	11.47073	289.5738	0.31577	1.1956	29.401	1.80E-05
1.9435	11.51003	289.561	0.31795	1.1957	29.401	1.80E-05
2.018	11.54065	289.5762	0.31963	1.1956	29.401	1.80E-05
2.093	11.56293	289.5818	0.32086	1.1956	29.401	1.80E-05
2.1675	11.59076	289.5799	0.32241	1.1956	29.401	1.80E-05
2.2425	11.62798	289.568	0.3245	1.1957	29.401	1.80E-05
2.317	11.65015	289.6019	0.32569	1.1955	29.401	1.80E-05
2.3925	11.65115	289.5733	0.32578	1.1956	29.401	1.80E-05
2.4665	11.65532	289.5967	0.32599	1.1955	29.401	1.80E-05
2.5415	11.67998	289.6017	0.32736	1.1955	29.401	1.80E-05
2.616	11.69052	289.592	0.32797	1.1955	29.401	1.80E-05
2.6915	11.70615	289.5801	0.32886	1.1956	29.401	1.80E-05
2.7655	11.70403	289.5992	0.32872	1.1955	29.401	1.80E-05
2.8405	11.71702	289.5729	0.32948	1.1956	29.401	1.80E-05
2.915	11.70416	289.6121	0.32871	1.1955	29.401	1.80E-05
2.9905	11.72254	289.6124	0.32974	1.1955	29.401	1.80E-05
3.09	11.71259	289.6167	0.32918	1.1954	29.401	1.80E-05
3.19	11.72162	289.6232	0.32968	1.1954	29.401	1.80E-05
3.29	11.73067	289.6122	0.3302	1.1955	29.401	1.80E-05
3.39	11.74509	289.6117	0.33101	1.1955	29.401	1.80E-05
3.4895	11.74857	289.6234	0.3312	1.1954	29.401	1.80E-05
3.5895	11.73098	289.6058	0.33023	1.1955	29.401	1.80E-05
3.6895	11.74845	289.646	0.33116	1.1953	29.401	1.80E-05
3.7895	11.75017	289.6409	0.33126	1.1953	29.401	1.80E-05

9/29/00	3:20 PM	LEC					
Rel Humidi	27						
y (cm)	Vmean (m	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)	
0	4.11976	289.7068	0.04071	1.1951	29.401	1.80E-05	
0.001	4.14404	289.6918	0.0412	1.1951	29.401	1.80E-05	
0.002	4.15382	289.6809	0.04139	1.1952	29.401	1.80E-05	
0.003	4.17345	289.6744	0.04179	1.1952	29.401	1.80E-05	
0.004	4.18353	289.6656	0.04199	1.1952	29.401	1.80E-05	
0.0045	4.25992	289.6395	0.04354	1.1953	29.401	1.80E-05	
0.0055	4.31193	289.6218	0.04461	1.1954	29.401	1.80E-05	
0.0065	4.40979	289.6503	0.04666	1.1953	29.401	1.80E-05	
0.0075	4.43759	289.6415	0.04725	1.1953	29.401	1.80E-05	
0.0085	4.56041	289.6105	0.0499	1.1955	29.401	1.80E-05	
0.0095	4.64584	289.6405	0.05179	1.1953	29.401	1.80E-05	
0.011	4.7484	289.607	0.0541	1.1955	29.401	1.80E-05	
0.013	4.91946	289.5885	0.05808	1.1956	29.401	1.80E-05	
0.0145	5.11266	289.5945	0.06273	1.1955	29.401	1.80E-05	
0.0165	5.23753	289.5953	0.06583	1.1955	29.401	1.80E-05	
0.0185	5.3871	289.5887	0.06964	1.1956	29.401	1.80E-05	
0.021	5.58995	289.5781	0.07499	1.1956	29.401	1.80E-05	
0.023	5.71734	289.5688	0.07845	1.1956	29.401	1.80E-05	
0.0245	5.86551	289.5738	0.08257	1.1956	29.401	1.80E-05	
0.0265	6.00336	289.5551	0.0865	1.1957	29.401	1.80E-05	
0.0285	6.10237	289.6027	0.08936	1.1955	29.401	1.80E-05	
0.031	6.21555	289.6372	0.09269	1.1954	29.401	1.80E-05	
0.033	6.31917	289.6641	0.0958	1.1952	29.401	1.80E-05	
0.0345	6.41401	289.7481	0.09867	1.1949	29.401	1.80E-05	
0.0365	6.48272	289.7728	0.10079	1.1948	29.401	1.80E-05	
0.0385	6.55072	289.8077	0.1029	1.1946	29.401	1.80E-05	
0.041	6.58862	289.8385	0.10408	1.1945	29.401	1.80E-05	
0.043	6.70473	289.8391	0.10778	1.1945	29.401	1.80E-05	
0.0445	6.82968	289.85	0.11183	1.1944	29.401	1.80E-05	
0.0495	6.99842	289.8562	0.11742	1.1944	29.401	1.80E-05	
0.0545	7.13654	289.8636	0.1221	1.1944	29.401	1.80E-05	
0.06	7.19946	289.8769	0.12426	1.1943	29.401	1.80E-05	
0.065	7.29719	289.8689	0.12766	1.1944	29.401	1.80E-05	
0.0695	7.39321	289.8615	0.13104	1.1944	29.401	1.80E-05	
0.0745	7.53497	289.8679	0.13611	1.1944	29.401	1.80E-05	
0.08	7.58968	289.8703	0.13809	1.1944	29.401	1.80E-05	
0.085	7.63657	289.8786	0.1398	1.1943	29.401	1.80E-05	
0.0895	7.70635	289.8866	0.14236	1.1943	29.401	1.80E-05	
0.0945	7.77029	289.8962	0.14473	1.1942	29.401	1.80E-05	
0.105	7.87571	289.867	0.1487	1.1944	29.401	1.80E-05	
0.1145	7.9033	289.8566	0.14975	1.1944	29.401	1.80E-05	
0.1245	8.07593	289.8892	0.15635	1.1943	29.401	1.80E-05	
0.1345	8.0825	289.8631	0.15661	1.1944	29.401	1.80E-05	
0.1445	8.19898	289.849	0.16117	1.1944	29.401	1.80E-05	
0.1545	8.2415	289.8572	0.16284	1.1944	29.401	1.80E-05	
0.1645	8.25537	289.8434	0.1634	1.1945	29.401	1.80E-05	
0.1745	8.34098	289.8564	0.1668	1.1944	29.401	1.80E-05	
0.1845	8.36835	289.8428	0.1679	1.1945	29.401	1.80E-05	
0.1945	8.43679	289.8545	0.17065	1.1944	29.401	1.80E-05	
0.22	8.56446	289.8391	0.17586	1.1945	29.401	1.80E-05	
0.2445	8.67289	289.828	0.18035	1.1945	29.401	1.80E-05	
0.2695	8.75213	289.8387	0.18366	1.1945	29.401	1.80E-05	
0.2945	8.85839	289.8572	0.18813	1.1944	29.401	1.80E-05	

0.3195	8.96003	289.8408	0.19248	1.1945	29.401	1.80E-05
0.3445	9.0539	289.8531	0.19653	1.1944	29.401	1.80E-05
0.3695	9.15692	289.852	0.20103	1.1944	29.401	1.80E-05
0.394	9.2174	289.8445	0.2037	1.1945	29.401	1.80E-05
0.4195	9.31239	289.8276	0.20793	1.1945	29.401	1.80E-05
0.444	9.37013	289.8537	0.2105	1.1944	29.401	1.80E-05
0.469	9.44285	289.8288	0.2138	1.1945	29.401	1.80E-05
0.494	9.48539	289.8693	0.2157	1.1944	29.401	1.80E-05
0.519	9.63023	289.8539	0.22235	1.1944	29.401	1.80E-05
0.544	9.66468	289.857	0.22394	1.1944	29.401	1.80E-05
0.5685	9.72625	289.859	0.2268	1.1944	29.401	1.80E-05
0.594	9.75024	289.8545	0.22792	1.1944	29.401	1.80E-05
0.644	9.90119	289.844	0.23504	1.1945	29.401	1.80E-05
0.6935	10.02659	289.8615	0.24102	1.1944	29.401	1.80E-05
0.7435	10.1499	289.8697	0.24698	1.1944	29.401	1.80E-05
0.7935	10.25616	289.8675	0.25218	1.1944	29.401	1.80E-05
0.8435	10.31781	289.9112	0.25518	1.1942	29.401	1.80E-05
0.893	10.43068	289.8773	0.26082	1.1943	29.401	1.80E-05
0.9435	10.56063	289.9036	0.26734	1.1942	29.401	1.80E-05
0.993	10.67719	289.92	0.27325	1.1941	29.401	1.80E-05
1.043	10.78671	289.9205	0.27889	1.1941	29.401	1.80E-05
1.093	10.83539	289.9014	0.28143	1.1942	29.401	1.80E-05
1.143	10.96979	289.8888	0.28847	1.1943	29.401	1.80E-05
1.1925	10.96938	289.9163	0.28842	1.1942	29.401	1.80E-05
1.267	11.09729	289.917	0.29518	1.1942	29.401	1.80E-05
1.3425	11.25419	289.9205	0.30359	1.1941	29.401	1.80E-05
1.4165	11.31628	289.9168	0.30695	1.1942	29.401	1.80E-05
1.492	11.37347	289.9256	0.31005	1.1941	29.401	1.80E-05
1.566	11.49085	289.9073	0.3165	1.1942	29.401	1.80E-05
1.6415	11.54482	289.9203	0.31947	1.1941	29.401	1.80E-05
1.7155	11.60533	289.8962	0.32285	1.1942	29.401	1.80E-05
1.791	11.63192	289.9139	0.32431	1.1942	29.401	1.80E-05
1.8655	11.6953	289.903	0.32787	1.1942	29.401	1.80E-05
1.941	11.72383	289.9001	0.32948	1.1942	29.401	1.80E-05
2.015	11.76273	289.8857	0.33168	1.1943	29.401	1.80E-05
2.09	11.76932	289.8977	0.33204	1.1942	29.401	1.80E-05
2.165	11.81648	289.8886	0.33472	1.1943	29.401	1.80E-05
2.24	11.80172	289.879	0.33389	1.1943	29.401	1.80E-05
2.3145	11.83546	289.8833	0.3358	1.1943	29.401	1.80E-05
2.389	11.84348	289.8862	0.33625	1.1943	29.401	1.80E-05
2.464	11.82669	289.8853	0.3353	1.1943	29.401	1.80E-05
2.539	11.8342	289.8804	0.33573	1.1943	29.401	1.80E-05
2.6135	11.82745	289.8974	0.33533	1.1942	29.401	1.80E-05
2.688	11.82381	289.8997	0.33512	1.1942	29.401	1.80E-05
2.7635	11.8291	289.9042	0.33541	1.1942	29.401	1.80E-05
2.838	11.83788	289.9005	0.33592	1.1942	29.401	1.80E-05
2.913	11.83786	289.8972	0.33592	1.1942	29.401	1.80E-05
2.987	11.84162	289.9131	0.33611	1.1942	29.401	1.80E-05
3.087	11.81953	289.8956	0.33488	1.1942	29.401	1.80E-05
3.1865	11.82371	289.9213	0.33509	1.1941	29.401	1.80E-05
3.2865	11.81936	289.8929	0.33488	1.1943	29.401	1.80E-05
3.3865	11.82037	289.8913	0.33493	1.1943	29.401	1.80E-05
3.486	11.81677	289.8718	0.33475	1.1943	29.401	1.80E-05
3.586	11.8192	289.889	0.33487	1.1943	29.401	1.80E-05
3.6855	11.80667	289.8923	0.33416	1.1943	29.401	1.80E-05
3.7855	11.80822	289.9012	0.33423	1.1942	29.401	1.80E-05

9/29/00 4:40 PM		TEC				
Rel Humidi 27						
y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg Patm ("Hg)	viscosity (kg/ms)	
0.0005	3.71015	289.3719	0.03306	1.1965	29.401	1.80E-05
0.0015	3.67689	289.3409	0.03247	1.1966	29.401	1.80E-05
0.0025	3.81787	289.3503	0.03501	1.1966	29.401	1.80E-05
0.004	3.92927	289.354	0.03708	1.1966	29.401	1.80E-05
0.005	4.00779	289.3567	0.03858	1.1966	29.401	1.80E-05
0.006	4.13832	289.368	0.04113	1.1965	29.401	1.80E-05
0.007	4.24605	289.3247	0.04331	1.1967	29.401	1.80E-05
0.008	4.37574	289.3505	0.04599	1.1966	29.401	1.80E-05
0.009	4.45333	289.3286	0.04764	1.1967	29.401	1.80E-05
0.01	4.57364	289.3347	0.05024	1.1967	29.401	1.80E-05
0.0105	4.68842	289.3413	0.0528	1.1966	29.401	1.80E-05
0.012	4.77461	289.3255	0.05476	1.1967	29.401	1.80E-05
0.013	4.87815	289.3339	0.05716	1.1967	29.401	1.80E-05
0.014	4.97847	289.3545	0.05953	1.1966	29.401	1.80E-05
0.0155	5.06552	289.352	0.06163	1.1966	29.401	1.80E-05
0.0165	5.14401	289.3616	0.06355	1.1965	29.401	1.80E-05
0.0185	5.28443	289.336	0.06707	1.1966	29.401	1.80E-05
0.02	5.47126	289.3177	0.07191	1.1967	29.401	1.80E-05
0.0215	5.57959	289.3222	0.07478	1.1967	29.401	1.80E-05
0.024	5.70964	289.3007	0.07831	1.1968	29.401	1.80E-05
0.026	5.92131	289.331	0.08422	1.1967	29.401	1.80E-05
0.028	5.94084	289.3384	0.08477	1.1966	29.401	1.80E-05
0.03	6.02959	289.4037	0.0873	1.1964	29.401	1.80E-05
0.032	6.14376	289.4425	0.09063	1.1962	29.401	1.80E-05
0.034	6.24686	289.4721	0.09369	1.1961	29.401	1.80E-05
0.0365	6.28319	289.536	0.09476	1.1958	29.401	1.80E-05
0.0385	6.36411	289.5606	0.0972	1.1957	29.401	1.80E-05
0.04	6.44601	289.6023	0.09971	1.1955	29.401	1.80E-05
0.0415	6.48111	289.6261	0.10079	1.1954	29.401	1.80E-05
0.044	6.55753	289.6249	0.10318	1.1954	29.401	1.80E-05
0.046	6.60693	289.6425	0.10473	1.1953	29.401	1.80E-05
0.048	6.649	289.651	0.10607	1.1953	29.401	1.80E-05
0.05	6.66163	289.6614	0.10647	1.1953	29.401	1.80E-05
0.0555	6.78	289.6313	0.1103	1.1954	29.401	1.80E-05
0.06	6.86916	289.6349	0.11321	1.1954	29.401	1.80E-05
0.065	6.94592	289.6362	0.11576	1.1954	29.401	1.80E-05
0.0695	7.10875	289.6534	0.12124	1.1953	29.401	1.80E-05
0.0755	7.18751	289.6709	0.12394	1.1952	29.401	1.80E-05
0.08	7.20871	289.653	0.12468	1.1953	29.401	1.80E-05
0.085	7.24593	289.6731	0.12596	1.1952	29.401	1.80E-05
0.09	7.31263	289.6481	0.1283	1.1953	29.401	1.80E-05
0.0955	7.36923	289.6697	0.13028	1.1952	29.401	1.80E-05
0.1	7.42878	289.622	0.13242	1.1954	29.401	1.80E-05
0.11	7.52883	289.6362	0.136	1.1954	29.401	1.80E-05
0.12	7.62047	289.6395	0.13933	1.1953	29.401	1.80E-05
0.13	7.70865	289.6391	0.14258	1.1953	29.401	1.80E-05
0.14	7.7507	289.6762	0.14412	1.1952	29.401	1.80E-05
0.15	7.80131	289.6814	0.146	1.1952	29.401	1.80E-05
0.16	7.8361	289.6859	0.1473	1.1951	29.401	1.80E-05
0.1695	7.89777	289.6766	0.14964	1.1952	29.401	1.80E-05
0.18	7.96167	289.6653	0.15207	1.1952	29.401	1.80E-05
0.1895	7.99748	289.6775	0.15344	1.1952	29.401	1.80E-05
0.2	8.10797	289.6791	0.15771	1.1952	29.401	1.80E-05
0.225	8.17393	289.6795	0.16028	1.1952	29.401	1.80E-05
0.2495	8.27187	289.6912	0.16414	1.1951	29.401	1.80E-05

0.2755	8.40428	289.6875	0.16944	1.1951	29.401	1.80E-05
0.3	8.45309	289.6785	0.17142	1.1952	29.401	1.80E-05
0.325	8.55399	289.6857	0.17553	1.1951	29.401	1.80E-05
0.3495	8.68983	289.6822	0.18115	1.1952	29.401	1.80E-05
0.375	8.69345	289.6875	0.1813	1.1951	29.401	1.80E-05
0.3995	8.82588	289.6873	0.18687	1.1951	29.401	1.80E-05
0.425	8.8658	289.6869	0.18856	1.1951	29.401	1.80E-05
0.4495	8.98603	289.697	0.1937	1.1951	29.401	1.80E-05
0.475	9.05052	289.6873	0.1965	1.1951	29.401	1.80E-05
0.4995	9.1107	289.6863	0.19912	1.1951	29.401	1.80E-05
0.5245	9.16801	289.697	0.20163	1.1951	29.401	1.80E-05
0.5495	9.26909	289.7027	0.20609	1.1951	29.401	1.80E-05
0.5745	9.29785	289.7251	0.20736	1.195	29.401	1.80E-05
0.5995	9.35267	289.7304	0.20981	1.195	29.401	1.80E-05
0.649	9.4742	289.7409	0.21529	1.1949	29.401	1.80E-05
0.699	9.56546	289.7356	0.21946	1.1949	29.401	1.80E-05
0.749	9.72265	289.7165	0.22675	1.195	29.401	1.80E-05
0.799	9.85362	289.7389	0.23288	1.1949	29.401	1.80E-05
0.8485	9.92909	289.7467	0.23645	1.1949	29.401	1.80E-05
0.899	10.00747	289.7567	0.24019	1.1948	29.401	1.80E-05
0.9485	10.10053	289.7586	0.24468	1.1948	29.401	1.80E-05
0.9985	10.20782	289.7567	0.2499	1.1948	29.401	1.80E-05
1.0485	10.25209	289.7711	0.25206	1.1948	29.401	1.80E-05
1.0985	10.38524	289.7463	0.25868	1.1949	29.401	1.80E-05
1.148	10.47115	289.7483	0.26297	1.1949	29.401	1.80E-05
1.1985	10.55029	289.7664	0.26694	1.1948	29.401	1.80E-05
1.273	10.66898	289.7549	0.273	1.1949	29.401	1.80E-05
1.3475	10.79749	289.7687	0.2796	1.1948	29.401	1.80E-05
1.422	10.8589	289.7765	0.28278	1.1948	29.401	1.80E-05
1.4975	10.96748	289.7912	0.28845	1.1947	29.401	1.80E-05
1.572	11.05244	289.7738	0.29295	1.1948	29.401	1.80E-05
1.647	11.14239	289.7639	0.29775	1.1948	29.401	1.80E-05
1.7215	11.20838	289.7785	0.30127	1.1947	29.401	1.80E-05
1.797	11.26993	289.7678	0.3046	1.1948	29.401	1.80E-05
1.871	11.37286	289.7553	0.3102	1.1948	29.401	1.80E-05
1.946	11.40533	289.744	0.31199	1.1949	29.401	1.80E-05
2.0205	11.45871	289.7754	0.31488	1.1948	29.401	1.80E-05
2.096	11.51811	289.7563	0.31818	1.1948	29.401	1.80E-05
2.17	11.53256	289.7383	0.319	1.1949	29.401	1.80E-05
2.2455	11.58415	289.7695	0.32182	1.1948	29.401	1.80E-05
2.32	11.60085	289.7528	0.32277	1.1949	29.401	1.80E-05
2.3955	11.63027	289.7732	0.32439	1.1948	29.401	1.80E-05
2.4695	11.64078	289.7456	0.325	1.1949	29.401	1.80E-05
2.5445	11.64642	289.7415	0.32532	1.1949	29.401	1.80E-05
2.6195	11.66176	289.7304	0.32619	1.195	29.401	1.80E-05
2.6945	11.69151	289.7489	0.32784	1.1949	29.401	1.80E-05
2.7685	11.68158	289.7298	0.3273	1.195	29.401	1.80E-05
2.8435	11.6801	289.7294	0.32722	1.195	29.401	1.80E-05
2.9185	11.67987	289.7288	0.32721	1.195	29.401	1.80E-05
2.993	11.69372	289.7048	0.32801	1.1951	29.401	1.80E-05
3.093	11.69555	289.7245	0.32809	1.195	29.401	1.80E-05
3.1925	11.68791	289.7446	0.32764	1.1949	29.401	1.80E-05
3.2925	11.69752	289.7331	0.32819	1.1949	29.401	1.80E-05
3.392	11.69495	289.7524	0.32803	1.1949	29.401	1.80E-05
3.492	11.7016	289.7331	0.32842	1.1949	29.401	1.80E-05
3.5915	11.69613	289.7617	0.32808	1.1948	29.401	1.80E-05
3.691	11.70597	289.7545	0.32864	1.1949	29.401	1.80E-05
3.791	11.70242	289.753	0.32845	1.1949	29.401	1.80E-05

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y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.0015	4.22652	289.6282	0.04286	1.1954	29.401	1.80E-05
0.0025	4.20598	289.6025	0.04245	1.1955	29.401	1.80E-05
0.0035	4.19529	289.6122	0.04223	1.1955	29.401	1.80E-05
0.0045	4.22804	289.6	0.0429	1.1955	29.401	1.80E-05
0.0055	4.22288	289.5809	0.0428	1.1956	29.401	1.80E-05
0.0065	4.24774	289.5978	0.0433	1.1955	29.401	1.80E-05
0.007	4.30069	289.6006	0.04438	1.1955	29.401	1.80E-05
0.008	4.39858	289.5776	0.04643	1.1956	29.401	1.80E-05
0.009	4.51254	289.5694	0.04887	1.1956	29.401	1.80E-05
0.01	4.55846	289.5828	0.04987	1.1956	29.401	1.80E-05
0.011	4.65006	289.5974	0.05189	1.1955	29.401	1.80E-05
0.012	4.73174	289.5879	0.05373	1.1956	29.401	1.80E-05
0.0135	4.80458	289.5965	0.05539	1.1955	29.401	1.80E-05
0.0145	4.91097	289.5931	0.05788	1.1955	29.401	1.80E-05
0.0155	4.97396	289.5807	0.05937	1.1956	29.401	1.80E-05
0.016	5.10048	289.5857	0.06243	1.1956	29.401	1.80E-05
0.018	5.23842	289.5875	0.06585	1.1956	29.401	1.80E-05
0.02	5.36571	289.6009	0.06909	1.1955	29.401	1.80E-05
0.0225	5.54694	289.6097	0.07383	1.1955	29.401	1.80E-05
0.0245	5.74942	289.5974	0.07932	1.1955	29.401	1.80E-05
0.0265	5.84144	289.5906	0.08189	1.1956	29.401	1.80E-05
0.028	6.00957	289.5885	0.08667	1.1956	29.401	1.80E-05
0.03	6.08558	289.5949	0.08887	1.1955	29.401	1.80E-05
0.032	6.18757	289.6019	0.09187	1.1955	29.401	1.80E-05
0.0345	6.28648	289.5906	0.09484	1.1956	29.401	1.80E-05
0.036	6.42106	289.5567	0.09895	1.1957	29.401	1.80E-05
0.038	6.53398	289.5292	0.10247	1.1958	29.401	1.80E-05
0.04	6.60098	289.5629	0.10457	1.1957	29.401	1.80E-05
0.0425	6.71914	289.5427	0.10836	1.1958	29.401	1.80E-05
0.0445	6.74964	289.5473	0.10934	1.1957	29.401	1.80E-05
0.0465	6.83711	289.5503	0.1122	1.1957	29.401	1.80E-05
0.048	6.88027	289.5518	0.11362	1.1957	29.401	1.80E-05
0.05	6.92955	289.569	0.11524	1.1956	29.401	1.80E-05
0.0555	7.10516	289.5082	0.12118	1.1959	29.401	1.80E-05
0.06	7.25822	289.5355	0.12645	1.1958	29.401	1.80E-05
0.0655	7.36543	289.5448	0.13021	1.1957	29.401	1.80E-05
0.07	7.44612	289.5427	0.13308	1.1958	29.401	1.80E-05
0.0755	7.53512	289.5364	0.13628	1.1958	29.401	1.80E-05
0.08	7.62471	289.5413	0.13954	1.1958	29.401	1.80E-05
0.0855	7.67979	289.5551	0.14155	1.1957	29.401	1.80E-05
0.09	7.75416	289.551	0.14431	1.1957	29.401	1.80E-05
0.0955	7.81102	289.5795	0.14642	1.1956	29.401	1.80E-05
0.1	7.81936	289.5898	0.14673	1.1956	29.401	1.80E-05
0.11	8.00002	289.6709	0.15354	1.1952	29.401	1.80E-05
0.12	8.05736	289.6949	0.15574	1.1951	29.401	1.80E-05
0.13	8.16111	289.7284	0.15975	1.195	29.401	1.80E-05
0.14	8.21222	289.7707	0.16174	1.1948	29.401	1.80E-05
0.15	8.27617	289.797	0.16425	1.1947	29.401	1.80E-05
0.16	8.32673	289.7904	0.16627	1.1947	29.401	1.80E-05
0.17	8.3967	289.7639	0.16909	1.1948	29.401	1.80E-05
0.18	8.42111	289.7839	0.17006	1.1947	29.401	1.80E-05
0.19	8.49104	289.7826	0.1729	1.1947	29.401	1.80E-05
0.2	8.51051	289.8013	0.17368	1.1947	29.401	1.80E-05
0.2255	8.65335	289.7962	0.17956	1.1947	29.401	1.80E-05
0.25	8.7555	289.806	0.18382	1.1946	29.401	1.80E-05

0.2755	8.87978	289.8309	0.18906	1.1945	29.401	1.80E-05
0.3	8.97168	289.8293	0.19299	1.1945	29.401	1.80E-05
0.3255	9.06693	289.8262	0.19711	1.1945	29.401	1.80E-05
0.35	9.17082	289.8479	0.20164	1.1945	29.401	1.80E-05
0.375	9.25756	289.8412	0.20548	1.1945	29.401	1.80E-05
0.4	9.33841	289.8241	0.2091	1.1946	29.401	1.80E-05
0.4255	9.39241	289.8342	0.21151	1.1945	29.401	1.80E-05
0.45	9.51182	289.8247	0.21693	1.1946	29.401	1.80E-05
0.475	9.55891	289.8256	0.21909	1.1945	29.401	1.80E-05
0.5	9.62951	289.8447	0.22232	1.1945	29.401	1.80E-05
0.5255	9.73201	289.8212	0.2271	1.1946	29.401	1.80E-05
0.55	9.7821	289.8486	0.22942	1.1944	29.401	1.80E-05
0.5755	9.87311	289.8329	0.23372	1.1945	29.401	1.80E-05
0.6	9.93898	289.8486	0.23684	1.1944	29.401	1.80E-05
0.65	10.06265	289.8744	0.24274	1.1943	29.401	1.80E-05
0.7	10.21	289.8578	0.24992	1.1944	29.401	1.80E-05
0.75	10.33697	289.843	0.25619	1.1945	29.401	1.80E-05
0.8	10.45577	289.8557	0.2621	1.1944	29.401	1.80E-05
0.8495	10.55724	289.8449	0.26722	1.1945	29.401	1.80E-05
0.8995	10.69879	289.8662	0.27441	1.1944	29.401	1.80E-05
0.9495	10.79684	289.8709	0.27946	1.1944	29.401	1.80E-05
0.9995	10.89811	289.8685	0.28473	1.1944	29.401	1.80E-05
1.049	11.03362	289.8804	0.29184	1.1943	29.401	1.80E-05
1.099	11.10349	289.856	0.29558	1.1944	29.401	1.80E-05
1.149	11.21575	289.8477	0.30159	1.1945	29.401	1.80E-05
1.199	11.30744	289.8611	0.30653	1.1944	29.401	1.80E-05
1.274	11.42582	289.864	0.31298	1.1944	29.401	1.80E-05
1.3485	11.54022	289.859	0.31928	1.1944	29.401	1.80E-05
1.424	11.62745	289.8479	0.32414	1.1945	29.401	1.80E-05
1.498	11.73498	289.8553	0.33016	1.1944	29.401	1.80E-05
1.5735	11.792	289.8656	0.33336	1.1944	29.401	1.80E-05
1.648	11.82744	289.8596	0.33537	1.1944	29.401	1.80E-05
1.7235	11.8918	289.8732	0.33902	1.1943	29.401	1.80E-05
1.7975	11.91742	289.8555	0.3405	1.1944	29.401	1.80E-05
1.8725	11.9185	289.8868	0.34052	1.1943	29.401	1.80E-05
1.9475	11.93825	289.8644	0.34168	1.1944	29.401	1.80E-05
2.0225	11.93024	289.8467	0.34124	1.1945	29.401	1.80E-05
2.097	11.94077	289.8521	0.34184	1.1944	29.401	1.80E-05
2.1715	11.94308	289.8424	0.34198	1.1945	29.401	1.80E-05
2.247	11.92967	289.8709	0.34118	1.1944	29.401	1.80E-05
2.3215	11.94254	289.8646	0.34193	1.1944	29.401	1.80E-05
2.3965	11.93982	289.8518	0.34179	1.1944	29.401	1.80E-05
2.471	11.94319	289.8535	0.34198	1.1944	29.401	1.80E-05
2.5465	11.93635	289.8338	0.34161	1.1945	29.401	1.80E-05
2.621	11.94401	289.874	0.342	1.1943	29.401	1.80E-05
2.696	11.94646	289.8558	0.34216	1.1944	29.401	1.80E-05
2.7705	11.93947	289.8572	0.34176	1.1944	29.401	1.80E-05
2.846	11.93438	289.835	0.3415	1.1945	29.401	1.80E-05
2.92	11.9471	289.8537	0.3422	1.1944	29.401	1.80E-05
2.9955	11.94996	289.8362	0.34239	1.1945	29.401	1.80E-05
3.095	11.95877	289.8586	0.34286	1.1944	29.401	1.80E-05
3.195	11.94499	289.8687	0.34206	1.1944	29.401	1.80E-05
3.295	11.95088	289.8705	0.3424	1.1944	29.401	1.80E-05
3.3945	11.94203	289.8888	0.34187	1.1943	29.401	1.80E-05
3.4945	11.94987	289.8915	0.34231	1.1943	29.401	1.80E-05
3.594	11.93912	289.8841	0.34171	1.1943	29.401	1.80E-05
3.694	11.93063	289.8757	0.34123	1.1943	29.401	1.80E-05
3.7935	11.94985	289.8866	0.34232	1.1943	29.401	1.80E-05

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Rel Humidi 27

y (cm)	Vmean (m/ T (degK)	DP ("H2O)	density (kg Patm ("Hg)	viscosity (kg/ms)
0.001	3.51926 289.8352	0.0297	1.1945	29.401 1.80E-05
0.002	3.60508 289.7976	0.03117	1.1947	29.401 1.80E-05
0.003	3.70699 289.7699	0.03296	1.1948	29.401 1.80E-05
0.004	3.86691 289.7943	0.03586	1.1947	29.401 1.80E-05
0.0045	3.95599 289.7861	0.03753	1.1947	29.401 1.80E-05
0.0055	4.07578 289.8001	0.03983	1.1947	29.401 1.80E-05
0.0065	4.21865 289.7769	0.04268	1.1948	29.401 1.80E-05
0.0075	4.3585 289.781	0.04556	1.1947	29.401 1.80E-05
0.0085	4.48749 289.7571	0.0483	1.1948	29.401 1.80E-05
0.0095	4.56517 289.7958	0.04998	1.1947	29.401 1.80E-05
0.0105	4.62067 289.7974	0.0512	1.1947	29.401 1.80E-05
0.012	4.77262 289.7898	0.05462	1.1947	29.401 1.80E-05
0.0125	4.88129 289.8052	0.05713	1.1946	29.401 1.80E-05
0.0135	4.96628 289.8292	0.05914	1.1945	29.401 1.80E-05
0.0145	5.08131 289.8219	0.06191	1.1946	29.401 1.80E-05
0.0155	5.13899 289.8325	0.06332	1.1945	29.401 1.80E-05
0.0175	5.30028 289.8005	0.06737	1.1947	29.401 1.80E-05
0.02	5.47674 289.804	0.07192	1.1946	29.401 1.80E-05
0.022	5.54366 289.8069	0.07369	1.1946	29.401 1.80E-05
0.024	5.76904 289.8153	0.0798	1.1946	29.401 1.80E-05
0.0255	5.83452 289.8167	0.08162	1.1946	29.401 1.80E-05
0.0275	5.92408 289.8299	0.08415	1.1945	29.401 1.80E-05
0.0295	6.03894 289.8165	0.08744	1.1946	29.401 1.80E-05
0.0315	6.17423 289.8251	0.0914	1.1945	29.401 1.80E-05
0.0335	6.21099 289.7972	0.09251	1.1947	29.401 1.80E-05
0.0355	6.27662 289.8104	0.09447	1.1946	29.401 1.80E-05
0.0375	6.3796 289.8128	0.09759	1.1946	29.401 1.80E-05
0.04	6.41665 289.8206	0.09872	1.1946	29.401 1.80E-05
0.042	6.48771 289.8223	0.10092	1.1946	29.401 1.80E-05
0.044	6.56875 289.8299	0.10346	1.1945	29.401 1.80E-05
0.0455	6.68218 289.8307	0.10706	1.1945	29.401 1.80E-05
0.047	6.69843 289.8463	0.10758	1.1945	29.401 1.80E-05
0.0495	6.7198 289.8338	0.10827	1.1945	29.401 1.80E-05
0.0545	6.84902 289.8418	0.11247	1.1945	29.401 1.80E-05
0.06	6.89591 289.834	0.11402	1.1945	29.401 1.80E-05
0.0645	7.02491 289.8001	0.11834	1.1947	29.401 1.80E-05
0.0695	7.10808 289.8073	0.12115	1.1946	29.401 1.80E-05
0.0745	7.15574 289.8143	0.12278	1.1946	29.401 1.80E-05
0.08	7.23405 289.8196	0.12548	1.1946	29.401 1.80E-05
0.0845	7.32355 289.8157	0.12861	1.1946	29.401 1.80E-05
0.0895	7.34766 289.818	0.12945	1.1946	29.401 1.80E-05
0.0945	7.40405 289.8303	0.13144	1.1945	29.401 1.80E-05
0.1	7.43291 289.8023	0.13248	1.1946	29.401 1.80E-05
0.1095	7.53916 289.8064	0.13629	1.1946	29.401 1.80E-05
0.12	7.64415 289.7769	0.14013	1.1948	29.401 1.80E-05
0.1295	7.71103 289.7857	0.14259	1.1947	29.401 1.80E-05
0.14	7.77008 289.8327	0.14476	1.1945	29.401 1.80E-05
0.1495	7.81402 289.8233	0.1464	1.1946	29.401 1.80E-05
0.16	7.8839 289.8069	0.14904	1.1946	29.401 1.80E-05
0.1695	7.94452 289.8065	0.15134	1.1946	29.401 1.80E-05
0.1795	8.00149 289.7966	0.15353	1.1947	29.401 1.80E-05
0.1895	8.05145 289.8071	0.15544	1.1946	29.401 1.80E-05
0.2	8.09368 289.7984	0.15708	1.1947	29.401 1.80E-05
0.2245	8.19715 289.8161	0.16112	1.1946	29.401 1.80E-05
0.2495	8.31984 289.8399	0.16596	1.1945	29.401 1.80E-05

0.2745	8.4404	289.8332	0.17081	1.1945	29.401	1.80E-05
0.2995	8.49894	289.8262	0.17319	1.1945	29.401	1.80E-05
0.3245	8.62684	289.812	0.17845	1.1946	29.401	1.80E-05
0.3495	8.69195	289.8114	0.18116	1.1946	29.401	1.80E-05
0.3745	8.75168	289.7989	0.18366	1.1947	29.401	1.80E-05
0.3995	8.88394	289.7951	0.18926	1.1947	29.401	1.80E-05
0.4245	8.95193	289.8083	0.19216	1.1946	29.401	1.80E-05
0.4495	9.01729	289.7913	0.19499	1.1947	29.401	1.80E-05
0.474	9.09092	289.8194	0.19816	1.1946	29.401	1.80E-05
0.4995	9.17808	289.8307	0.20197	1.1945	29.401	1.80E-05
0.5245	9.28023	289.8418	0.20649	1.1945	29.401	1.80E-05
0.549	9.29629	289.8315	0.20721	1.1945	29.401	1.80E-05
0.574	9.37818	289.8007	0.2109	1.1947	29.401	1.80E-05
0.599	9.45004	289.8153	0.21413	1.1946	29.401	1.80E-05
0.6485	9.55647	289.8239	0.21898	1.1946	29.401	1.80E-05
0.699	9.68951	289.8042	0.22513	1.1946	29.401	1.80E-05
0.7485	9.80907	289.7824	0.23074	1.1947	29.401	1.80E-05
0.7985	9.95526	289.7707	0.23768	1.1948	29.401	1.80E-05
0.848	10.03953	289.7331	0.24175	1.1949	29.401	1.80E-05
0.898	10.18362	289.7395	0.24874	1.1949	29.401	1.80E-05
0.948	10.30656	289.7465	0.25477	1.1949	29.401	1.80E-05
0.998	10.39365	289.7329	0.25911	1.1949	29.401	1.80E-05
1.0475	10.48667	289.7508	0.26375	1.1949	29.401	1.80E-05
1.0975	10.58962	289.7621	0.26894	1.1948	29.401	1.80E-05
1.147	10.66055	289.7286	0.27259	1.195	29.401	1.80E-05
1.197	10.77927	289.744	0.27868	1.1949	29.401	1.80E-05
1.2725	10.91186	289.7407	0.28558	1.1949	29.401	1.80E-05
1.3465	11.02183	289.7294	0.29138	1.195	29.401	1.80E-05
1.4225	11.17006	289.7235	0.29927	1.195	29.401	1.80E-05
1.496	11.27403	289.7128	0.30488	1.195	29.401	1.80E-05
1.5715	11.36744	289.7089	0.30996	1.195	29.401	1.80E-05
1.646	11.44218	289.7196	0.31404	1.195	29.401	1.80E-05
1.7215	11.52978	289.7033	0.31888	1.1951	29.401	1.80E-05
1.7955	11.62794	289.7179	0.32432	1.195	29.401	1.80E-05
1.8705	11.69195	289.6959	0.32793	1.1951	29.401	1.80E-05
1.945	11.72275	289.6789	0.32968	1.1952	29.401	1.80E-05
2.02	11.76055	289.6738	0.33181	1.1952	29.401	1.80E-05
2.0945	11.80343	289.654	0.33426	1.1953	29.401	1.80E-05
2.169	11.81686	289.6758	0.33499	1.1952	29.401	1.80E-05
2.244	11.83099	289.666	0.33581	1.1952	29.401	1.80E-05
2.319	11.8456	289.6678	0.33663	1.1952	29.401	1.80E-05
2.3935	11.852	289.6637	0.337	1.1952	29.401	1.80E-05
2.468	11.84917	289.6807	0.33682	1.1952	29.401	1.80E-05
2.5435	11.86146	289.6853	0.33752	1.1951	29.401	1.80E-05
2.618	11.85785	289.6647	0.33734	1.1952	29.401	1.80E-05
2.693	11.86883	289.689	0.33793	1.1951	29.401	1.80E-05
2.7675	11.8784	289.7325	0.33842	1.1949	29.401	1.80E-05
2.843	11.87822	289.6962	0.33846	1.1951	29.401	1.80E-05
2.917	11.88546	289.7415	0.33882	1.1949	29.401	1.80E-05
2.9925	11.87248	289.7177	0.3381	1.195	29.401	1.80E-05
3.092	11.87467	289.6986	0.33825	1.1951	29.401	1.80E-05
3.192	11.88039	289.7033	0.33857	1.1951	29.401	1.80E-05
3.2915	11.89169	289.7087	0.33921	1.195	29.401	1.80E-05
3.391	11.89071	289.6762	0.33919	1.1952	29.401	1.80E-05
3.491	11.88219	289.6906	0.33869	1.1951	29.401	1.80E-05
3.5905	11.88939	289.7251	0.33906	1.195	29.401	1.80E-05
3.6905	11.88054	289.7013	0.33858	1.1951	29.401	1.80E-05
3.79	11.88498	289.6875	0.33885	1.1951	29.401	1.80E-05

Representative Leading Edge Values $\delta_{99} = 1.9415$
 $C_f = 0.003615$ $U_{inf} = 11.8294$ $U^* = 0.502923$

y	u	y/ δ_{99}	u/ U_{inf}	y+	u+
0.001	4.16052	0.000515	0.35171	3.34E-01	8.272671
0.0015	4.13828	0.000773	0.34983	5.00E-01	8.228449
0.0025	4.09968	0.001288	0.346567	8.34E-01	8.151698
0.0035	4.09858	0.001803	0.346474	1.17E+00	8.149511
0.004	4.08997	0.00206	0.345746	1.33E+00	8.132391
0.005	4.11041	0.002575	0.347474	1.67E+00	8.173033
0.006	4.12999	0.00309	0.349129	2.00E+00	8.211966
0.007	4.19046	0.003605	0.354241	2.34E+00	8.332203
0.008	4.241	0.004121	0.358514	2.67E+00	8.432695
0.0095	4.29498	0.004893	0.363077	3.17E+00	8.540028
0.0105	4.4609	0.005408	0.377103	3.50E+00	8.869939
0.0115	4.53899	0.005923	0.383704	3.84E+00	9.025211
0.012	4.58977	0.006181	0.387997	4.00E+00	9.12618
0.013	4.70302	0.006696	0.39757	4.34E+00	9.351364
0.014	4.77497	0.007211	0.403653	4.67E+00	9.494427
0.015	4.86179	0.007726	0.410992	5.00E+00	9.667058
0.0175	5.04749	0.009014	0.42669	5.84E+00	10.0363
0.02	5.23888	0.010301	0.442869	6.67E+00	10.41685
0.022	5.37491	0.011331	0.454369	7.34E+00	10.68733
0.0235	5.59613	0.012104	0.47307	7.84E+00	11.1272
0.025	5.72599	0.012877	0.484047	8.34E+00	11.38541
0.0275	5.87562	0.014164	0.496696	9.17E+00	11.68293
0.0295	5.97069	0.015194	0.504733	9.84E+00	11.87197
0.0315	6.11291	0.016225	0.516756	1.05E+01	12.15475
0.0335	6.19743	0.017255	0.523901	1.12E+01	12.32281
0.035	6.36068	0.018027	0.537701	1.17E+01	12.64741
0.0375	6.39362	0.019315	0.540486	1.25E+01	12.71291
0.04	6.51967	0.020603	0.551141	1.33E+01	12.96354
0.0415	6.60149	0.021375	0.558058	1.38E+01	13.12623
0.0435	6.68033	0.022405	0.564723	1.45E+01	13.283
0.045	6.65511	0.023178	0.562591	1.50E+01	13.23285
0.047	6.80103	0.024208	0.574926	1.57E+01	13.52299
0.0495	6.93763	0.025496	0.586474	1.65E+01	13.7946
0.054	7.03376	0.027814	0.5946	1.80E+01	13.98575
0.06	7.1747	0.030904	0.606514	2.00E+01	14.26599
0.0645	7.3244	0.033222	0.619169	2.15E+01	14.56365
0.0695	7.34061	0.035797	0.62054	2.32E+01	14.59588
0.074	7.44622	0.038115	0.629467	2.47E+01	14.80587
0.08	7.53097	0.041205	0.636632	2.67E+01	14.97439
0.084	7.59114	0.043266	0.641718	2.80E+01	15.09403
0.0895	7.69528	0.046098	0.650522	2.99E+01	15.3011
0.094	7.74598	0.048416	0.654808	3.14E+01	15.40191
0.1	7.79439	0.051507	0.6589	3.34E+01	15.49816
0.1095	7.93065	0.0564	0.670419	3.65E+01	15.7691
0.1195	7.99341	0.06155	0.675724	3.99E+01	15.89389
0.1295	8.03071	0.066701	0.678877	4.32E+01	15.96806
0.1395	8.08925	0.071852	0.683826	4.65E+01	16.08446

0.149	8.2107	0.076745	0.694093	4.97E+01	16.32594
0.1595	8.21446	0.082153	0.694411	5.32E+01	16.33342
0.169	8.28586	0.087046	0.700446	5.64E+01	16.47539
0.1795	8.33204	0.092454	0.70435	5.99E+01	16.56721
0.189	8.40014	0.097347	0.710107	6.31E+01	16.70262
0.199	8.43577	0.102498	0.713119	6.64E+01	16.77347
0.2235	8.56435	0.115117	0.723989	7.46E+01	17.02913
0.2485	8.66667	0.127994	0.732638	8.29E+01	17.23258
0.2735	8.79159	0.14087	0.743198	9.12E+01	17.48097
0.2985	8.87302	0.153747	0.750082	9.96E+01	17.64288
0.323	8.92275	0.166366	0.754286	1.08E+02	17.74177
0.348	9.09143	0.179243	0.768545	1.16E+02	18.07717
0.373	9.14429	0.192119	0.773014	1.24E+02	18.18227
0.398	9.19491	0.204996	0.777293	1.33E+02	18.28292
0.423	9.32031	0.217873	0.787894	1.41E+02	18.53226
0.4475	9.39777	0.230492	0.794442	1.49E+02	18.68628
0.4725	9.48193	0.243369	0.801556	1.58E+02	18.85363
0.497	9.55527	0.255988	0.807756	1.66E+02	18.99945
0.5225	9.61123	0.269122	0.812487	1.74E+02	19.11072
0.5465	9.67222	0.281483	0.817642	1.82E+02	19.23199
0.572	9.73841	0.294618	0.823238	1.91E+02	19.3636
0.597	9.80653	0.307494	0.828996	1.99E+02	19.49905
0.646	9.94898	0.332732	0.841038	2.16E+02	19.7823
0.696	10.06856	0.358486	0.851147	2.32E+02	20.02007
0.746	10.19837	0.384239	0.862121	2.49E+02	20.27818
0.7955	10.3003	0.409735	0.870737	2.65E+02	20.48085
0.8455	10.45033	0.435488	0.88342	2.82E+02	20.77917
0.895	10.56329	0.460984	0.892969	2.99E+02	21.00377
0.945	10.68216	0.486737	0.903018	3.15E+02	21.24013
0.995	10.80036	0.51249	0.91301	3.32E+02	21.47516
1.0445	10.88159	0.537986	0.919877	3.48E+02	21.63667
1.094	10.99239	0.563482	0.929243	3.65E+02	21.85699
1.144	11.03423	0.589235	0.93278	3.82E+02	21.94018
1.1935	11.1213	0.614731	0.940141	3.98E+02	22.11331
1.2685	11.24823	0.653361	0.950871	4.23E+02	22.36569
1.3435	11.35348	0.691991	0.959768	4.48E+02	22.57497
1.418	11.47068	0.730363	0.969676	4.73E+02	22.808
1.4925	11.55796	0.768736	0.977054	4.98E+02	22.98155
1.567	11.60531	0.807108	0.981057	5.23E+02	23.0757
1.642	11.66493	0.845738	0.986097	5.48E+02	23.19425
1.7165	11.71816	0.88411	0.990596	5.73E+02	23.30009

Representative Trailing Edge Values				delta99 =	2.7655		
				Uinf =	11.7263	U* =	0.49854
y	u	y/delta99	u/Uinf	y+	u+	Rex =	7.79E+05
						Avg Cf =	0.003486
0.0005	3.83869	0.000181	0.327357	1.66E-01	7.699861		
0.0015	3.87465	0.000542	0.330424	4.97E-01	7.771992		
0.0025	3.82072	0.000904	0.325825	8.28E-01	7.663816		
0.003	3.93954	0.001085	0.335958	9.93E-01	7.902152		
0.004	4.03204	0.001446	0.343846	1.32E+00	8.087693		
0.005	4.12101	0.001808	0.351433	1.66E+00	8.266154		
0.006	4.29419	0.00217	0.366202	1.99E+00	8.613529		
0.007	4.3699	0.002531	0.372658	2.32E+00	8.765392		
0.0085	4.44722	0.003074	0.379252	2.81E+00	8.920485		
0.0095	4.56863	0.003435	0.389605	3.15E+00	9.164016		
0.0105	4.66586	0.003797	0.397897	3.48E+00	9.359045		
0.0115	4.81049	0.004158	0.410231	3.81E+00	9.649152		
0.0125	4.91616	0.00452	0.419242	4.14E+00	9.861111		
0.0135	4.94252	0.004882	0.42149	4.47E+00	9.913986		
0.014	5.02426	0.005062	0.428461	4.63E+00	10.07794		
0.015	5.12431	0.005424	0.436993	4.97E+00	10.27863		
0.017	5.25625	0.006147	0.448245	5.63E+00	10.54328		
0.0195	5.47566	0.007051	0.466955	6.46E+00	10.98339		
0.0215	5.60637	0.007774	0.478102	7.12E+00	11.24557		
0.0235	5.62895	0.008498	0.480028	7.78E+00	11.29087		
0.025	5.8479	0.00904	0.4987	8.28E+00	11.73005		
0.0275	5.93461	0.009944	0.506094	9.10E+00	11.90398		
0.03	6.02167	0.010848	0.513518	9.93E+00	12.07861		
0.032	6.11996	0.011571	0.5219	1.06E+01	12.27576		
0.0335	6.26649	0.012114	0.534396	1.11E+01	12.56968		
0.035	6.28718	0.012656	0.536161	1.16E+01	12.61118		
0.037	6.36318	0.013379	0.542642	1.22E+01	12.76363		
0.0395	6.43953	0.014283	0.549153	1.31E+01	12.91677		
0.0415	6.51113	0.015006	0.555259	1.37E+01	13.06039		
0.043	6.5648	0.015549	0.559836	1.42E+01	13.16805		
0.045	6.63638	0.016272	0.56594	1.49E+01	13.31163		
0.047	6.69611	0.016995	0.571033	1.56E+01	13.43144		
0.0495	6.70023	0.017899	0.571385	1.64E+01	13.4397		
0.054	6.76715	0.019526	0.577092	1.79E+01	13.57393		
0.0595	6.91834	0.021515	0.589985	1.97E+01	13.8772		
0.064	7.00778	0.023142	0.597612	2.12E+01	14.0566		
0.0695	7.07813	0.025131	0.603612	2.30E+01	14.19771		
0.074	7.18193	0.026758	0.612463	2.45E+01	14.40592		
0.0795	7.2159	0.028747	0.61536	2.63E+01	14.47406		
0.084	7.26426	0.030374	0.619484	2.78E+01	14.57106		
0.0895	7.38202	0.032363	0.629527	2.96E+01	14.80727		
0.094	7.38438	0.03399	0.629728	3.11E+01	14.81201		
0.0995	7.45108	0.035979	0.635416	3.29E+01	14.9458		
0.1095	7.49008	0.039595	0.638742	3.63E+01	15.02403		
0.119	7.61373	0.04303	0.649287	3.94E+01	15.27205		
0.1295	7.67317	0.046827	0.654356	4.29E+01	15.39128		
0.139	7.7584	0.050262	0.661624	4.60E+01	15.56224		

0.1495	7.80989	0.054059	0.666015	4.95E+01	15.66552
0.159	7.86314	0.057494	0.670556	5.26E+01	15.77233
0.1695	7.95549	0.061291	0.678431	5.61E+01	15.95757
0.179	7.94319	0.064726	0.677382	5.93E+01	15.9329
0.1895	8.00425	0.068523	0.68259	6.27E+01	16.05538
0.199	8.05613	0.071958	0.687014	6.59E+01	16.15944
0.2235	8.15992	0.080817	0.695865	7.40E+01	16.36763
0.249	8.26407	0.090038	0.704747	8.24E+01	16.57654
0.2735	8.34893	0.098897	0.711983	9.05E+01	16.74675
0.2985	8.43928	0.107937	0.719688	9.88E+01	16.92798
0.3235	8.55	0.116977	0.72913	1.07E+02	17.15007
0.3485	8.64784	0.126017	0.737474	1.15E+02	17.34633
0.3735	8.72115	0.135057	0.743726	1.24E+02	17.49337
0.398	8.8113	0.143916	0.751413	1.32E+02	17.6742
0.423	8.91766	0.152956	0.760484	1.40E+02	17.88755
0.448	8.96027	0.161996	0.764117	1.48E+02	17.97302
0.473	8.99836	0.171036	0.767366	1.57E+02	18.04942
0.4975	9.05708	0.179895	0.772373	1.65E+02	18.1672
0.523	9.16244	0.189116	0.781358	1.73E+02	18.37854
0.548	9.20699	0.198156	0.785157	1.81E+02	18.4679
0.573	9.32623	0.207196	0.795326	1.90E+02	18.70708
0.5975	9.34961	0.216055	0.79732	1.98E+02	18.75398
0.6475	9.48568	0.234135	0.808924	2.14E+02	19.02691
0.697	9.61156	0.252034	0.819658	2.31E+02	19.27941
0.747	9.73072	0.270114	0.82982	2.47E+02	19.51843
0.797	9.86659	0.288194	0.841407	2.64E+02	19.79096
0.847	9.93695	0.306274	0.847407	2.80E+02	19.9321
0.8965	10.05298	0.324173	0.857302	2.97E+02	20.16483
0.9465	10.16754	0.342253	0.867071	3.13E+02	20.39463
0.9965	10.25745	0.360333	0.874739	3.30E+02	20.57497
1.046	10.31676	0.378232	0.879797	3.46E+02	20.69394
1.096	10.40712	0.396312	0.887502	3.63E+02	20.87519
1.146	10.51884	0.414392	0.89703	3.79E+02	21.09928
1.1955	10.6002	0.432291	0.903968	3.96E+02	21.26248
1.2715	10.74445	0.459772	0.916269	4.21E+02	21.55182
1.345	10.84452	0.48635	0.924803	4.45E+02	21.75255
1.4205	10.95801	0.51365	0.934481	4.70E+02	21.98019
1.4945	11.04459	0.540409	0.941865	4.95E+02	22.15386
1.57	11.17288	0.567709	0.952805	5.20E+02	22.41119
1.644	11.26676	0.594468	0.960811	5.44E+02	22.5995
1.719	11.29291	0.621587	0.963041	5.69E+02	22.65196
1.794	11.40524	0.648707	0.972621	5.94E+02	22.87727
1.869	11.47073	0.675827	0.978205	6.19E+02	23.00864
1.9435	11.51003	0.702766	0.981557	6.43E+02	23.08747
2.018	11.54065	0.729705	0.984168	6.68E+02	23.14889
2.093	11.56293	0.756825	0.986068	6.93E+02	23.19358
2.1675	11.59076	0.783764	0.988441	7.18E+02	23.2494
2.2425	11.62798	0.810884	0.991615	7.42E+02	23.32406

APPENDIX B

Pitted Panel Skin Friction Data

10/2/00	2:11 PM	1				
Rel Humidi	49					
y (cm)	Vmean (m/	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.001	3.94069	288.1951	0.03689	1.1834	29	1.79E-05
0.0015	3.989	288.1508	0.0378	1.1836	29	1.79E-05
0.0025	4.07904	288.1392	0.03953	1.1837	29	1.79E-05
0.0035	4.07894	288.1463	0.03953	1.1836	29	1.79E-05
0.005	4.14819	288.1447	0.04088	1.1836	29	1.79E-05
0.006	4.28658	288.1387	0.04366	1.1837	29	1.79E-05
0.007	4.33101	288.109	0.04457	1.1838	29	1.79E-05
0.0075	4.52165	288.1084	0.04858	1.1838	29	1.79E-05
0.0085	4.59207	288.099	0.05011	1.1838	29	1.79E-05
0.0095	4.6664	288.1107	0.05174	1.1838	29	1.79E-05
0.0105	4.79892	288.0998	0.05472	1.1838	29	1.79E-05
0.0115	4.88494	288.0848	0.05671	1.1839	29	1.79E-05
0.0125	4.91958	288.1006	0.05751	1.1838	29	1.79E-05
0.0135	5.07333	288.0879	0.06116	1.1839	29	1.79E-05
0.015	5.12806	288.0875	0.06249	1.1839	29	1.79E-05
0.016	5.17589	288.068	0.06367	1.184	29	1.79E-05
0.018	5.39841	288.0906	0.06925	1.1839	29	1.79E-05
0.0195	5.52591	288.1012	0.07256	1.1838	29	1.79E-05
0.0215	5.72566	288.0967	0.0779	1.1839	29	1.79E-05
0.0235	5.80949	288.1068	0.0802	1.1838	29	1.79E-05
0.026	5.9285	288.0699	0.08353	1.184	29	1.79E-05
0.0275	6.09724	288.0822	0.08835	1.1839	29	1.79E-05
0.0295	6.16249	288.0998	0.09024	1.1838	29	1.79E-05
0.0315	6.23342	288.1041	0.09233	1.1838	29	1.79E-05
0.034	6.35857	288.1035	0.09607	1.1838	29	1.79E-05
0.036	6.43461	288.0979	0.09839	1.1839	29	1.79E-05
0.038	6.50157	288.1162	0.10044	1.1838	29	1.79E-05
0.0395	6.59172	288.1144	0.10324	1.1838	29	1.79E-05
0.0415	6.59735	288.0965	0.10343	1.1839	29	1.79E-05
0.0435	6.6608	288.1326	0.10541	1.1837	29	1.79E-05
0.046	6.79432	288.1509	0.10967	1.1836	29	1.79E-05
0.0475	6.79904	288.1904	0.10981	1.1834	29	1.79E-05
0.0495	6.88663	288.2171	0.11265	1.1833	29	1.80E-05
0.0555	6.9807	288.2503	0.11573	1.1832	29	1.80E-05
0.0595	7.11487	288.3133	0.12019	1.1829	29	1.80E-05
0.065	7.19971	288.3297	0.12307	1.1828	29	1.80E-05
0.0695	7.23397	288.3528	0.12423	1.1827	29	1.80E-05
0.0755	7.31918	288.3967	0.12716	1.1825	29	1.80E-05
0.0795	7.33785	288.3775	0.12782	1.1826	29	1.80E-05
0.0845	7.49529	288.4023	0.13335	1.1825	29	1.80E-05
0.0895	7.51121	288.3961	0.13392	1.1826	29	1.80E-05
0.095	7.59847	288.4125	0.13704	1.1825	29	1.80E-05
0.0995	7.67111	288.4035	0.13968	1.1825	29	1.80E-05
0.1095	7.70979	288.4285	0.14107	1.1824	29	1.80E-05
0.1195	7.78115	288.4052	0.14371	1.1825	29	1.80E-05
0.129	7.84718	288.39	0.14617	1.1826	29	1.80E-05
0.1395	7.88834	288.407	0.1477	1.1825	29	1.80E-05
0.149	8.0164	288.4037	0.15253	1.1825	29	1.80E-05
0.159	8.08826	288.3715	0.1553	1.1827	29	1.80E-05
0.169	8.07693	288.4025	0.15485	1.1825	29	1.80E-05
0.179	8.15008	288.4076	0.15766	1.1825	29	1.80E-05
0.189	8.20993	288.3961	0.15999	1.1826	29	1.80E-05
0.199	8.26871	288.4035	0.16229	1.1825	29	1.80E-05
0.224	8.33409	288.4047	0.16486	1.1825	29	1.80E-05
0.249	8.50433	288.3883	0.17168	1.1826	29	1.80E-05

0.274	8.57809	288.4019	0.17466	1.1825	29	1.80E-05
0.2985	8.66903	288.3914	0.17839	1.1826	29	1.80E-05
0.3235	8.75576	288.3978	0.18197	1.1825	29	1.80E-05
0.3485	8.83909	288.4037	0.18545	1.1825	29	1.80E-05
0.3735	8.95627	288.3916	0.1904	1.1826	29	1.80E-05
0.3985	8.99914	288.4222	0.19221	1.1824	29	1.80E-05
0.423	9.07391	288.4041	0.19543	1.1825	29	1.80E-05
0.448	9.13593	288.3912	0.19812	1.1826	29	1.80E-05
0.473	9.26222	288.3744	0.20365	1.1826	29	1.80E-05
0.498	9.35936	288.3869	0.20793	1.1826	29	1.80E-05
0.5225	9.38421	288.3809	0.20904	1.1826	29	1.80E-05
0.5475	9.43494	288.3613	0.21132	1.1827	29	1.80E-05
0.5725	9.5065	288.377	0.21453	1.1826	29	1.80E-05
0.598	9.59434	288.3894	0.2185	1.1826	29	1.80E-05
0.6475	9.72607	288.3887	0.22454	1.1826	29	1.80E-05
0.6975	9.83736	288.4107	0.22969	1.1825	29	1.80E-05
0.747	9.88943	288.4111	0.23213	1.1825	29	1.80E-05
0.797	10.07712	288.4099	0.24103	1.1825	29	1.80E-05
0.8465	10.13511	288.3836	0.24383	1.1826	29	1.80E-05
0.8965	10.29456	288.4023	0.25155	1.1825	29	1.80E-05
0.946	10.39539	288.3902	0.25651	1.1826	29	1.80E-05
0.9965	10.45515	288.3795	0.25948	1.1826	29	1.80E-05
1.046	10.6066	288.3803	0.26705	1.1826	29	1.80E-05
1.0955	10.66136	288.401	0.26979	1.1825	29	1.80E-05
1.145	10.75103	288.393	0.27436	1.1826	29	1.80E-05
1.1955	10.84387	288.4004	0.27911	1.1825	29	1.80E-05
1.2695	10.97098	288.4025	0.28569	1.1825	29	1.80E-05
1.3445	11.11241	288.4152	0.29309	1.1825	29	1.80E-05
1.419	11.15801	288.4162	0.2955	1.1825	29	1.80E-05
1.494	11.2383	288.4263	0.29976	1.1824	29	1.80E-05
1.568	11.31606	288.4191	0.30393	1.1825	29	1.80E-05
1.6425	11.37559	288.4451	0.3071	1.1823	29	1.80E-05
1.718	11.4091	288.441	0.30892	1.1824	29	1.80E-05
1.792	11.42833	288.4396	0.30996	1.1824	29	1.80E-05
1.867	11.43809	288.4542	0.31048	1.1823	29	1.80E-05
1.9415	11.45712	288.4533	0.31151	1.1823	29	1.80E-05
2.0175	11.45065	288.4525	0.31116	1.1823	29	1.80E-05
2.0915	11.47171	288.4704	0.31229	1.1822	29	1.80E-05
2.167	11.48914	288.4767	0.31323	1.1822	29	1.80E-05
2.2415	11.48029	288.4866	0.31274	1.1822	29	1.80E-05
2.3175	11.47358	288.463	0.3124	1.1823	29	1.80E-05
2.3915	11.48984	288.4724	0.31327	1.1822	29	1.80E-05
2.467	11.49377	288.481	0.31348	1.1822	29	1.80E-05
2.5415	11.49393	288.4817	0.31348	1.1822	29	1.80E-05
2.617	11.48145	288.4835	0.3128	1.1822	29	1.80E-05
2.6915	11.50461	288.4501	0.3141	1.1823	29	1.80E-05
2.767	11.4984	288.4542	0.31376	1.1823	29	1.80E-05
2.8415	11.50965	288.4669	0.31436	1.1822	29	1.80E-05
2.917	11.49711	288.4544	0.31369	1.1823	29	1.80E-05
2.9915	11.49993	288.4427	0.31386	1.1823	29	1.80E-05
3.0915	11.50587	288.4683	0.31415	1.1822	29	1.80E-05
3.1915	11.49776	288.4622	0.31372	1.1823	29	1.80E-05
3.2915	11.51472	288.4628	0.31464	1.1823	29	1.80E-05
3.3915	11.51368	288.4386	0.31461	1.1824	29	1.80E-05
3.491	11.51116	288.4544	0.31446	1.1823	29	1.80E-05
3.591	11.52911	288.4408	0.31545	1.1824	29	1.80E-05
3.691	11.52034	288.4445	0.31497	1.1823	29	1.80E-05
3.791	11.53475	288.4261	0.31578	1.1824	29	1.80E-05

10/2/00	3:56 PM	2				
Rel Humidi	49					
y (cm)	Vmean (m	T (degK)	DP ("H2O)	density (kg Patm ("Hg)	viscosity (kg/ms)	
0.001	3.83841	288.4253	0.03497	1.1824	29	1.80E-05
0.0015	3.96538	288.4136	0.03732	1.1825	29	1.80E-05
0.0025	4.0783	288.392	0.03948	1.1826	29	1.80E-05
0.0035	4.22679	288.4049	0.04241	1.1825	29	1.80E-05
0.0045	4.26774	288.3898	0.04323	1.1826	29	1.80E-05
0.0055	4.4233	288.3932	0.04644	1.1826	29	1.80E-05
0.0065	4.47376	288.3916	0.04751	1.1826	29	1.80E-05
0.008	4.59407	288.399	0.0501	1.1825	29	1.80E-05
0.009	4.63357	288.3768	0.05097	1.1826	29	1.80E-05
0.01	4.75044	288.3824	0.05357	1.1826	29	1.80E-05
0.011	4.8568	288.3933	0.05599	1.1826	29	1.80E-05
0.012	4.93661	288.3652	0.05785	1.1827	29	1.80E-05
0.0125	4.97379	288.3906	0.05872	1.1826	29	1.80E-05
0.0135	5.05196	288.3779	0.06059	1.1826	29	1.80E-05
0.0145	5.04394	288.3674	0.0604	1.1827	29	1.80E-05
0.0155	5.14523	288.3881	0.06284	1.1826	29	1.80E-05
0.0175	5.19927	288.3729	0.06417	1.1827	29	1.80E-05
0.02	5.30302	288.3816	0.06676	1.1826	29	1.80E-05
0.0215	5.40921	288.3572	0.06946	1.1827	29	1.80E-05
0.0235	5.48311	288.3631	0.07137	1.1827	29	1.80E-05
0.0255	5.53632	288.357	0.07276	1.1827	29	1.80E-05
0.028	5.61433	288.3473	0.07483	1.1828	29	1.80E-05
0.03	5.70144	288.3504	0.07717	1.1828	29	1.80E-05
0.032	5.78101	288.3373	0.07934	1.1828	29	1.80E-05
0.0335	5.82962	288.3627	0.08068	1.1827	29	1.80E-05
0.0355	5.89935	288.3328	0.08263	1.1828	29	1.80E-05
0.0375	5.91612	288.3371	0.0831	1.1828	29	1.80E-05
0.04	5.93662	288.3401	0.08367	1.1828	29	1.80E-05
0.0415	5.9552	288.3245	0.0842	1.1829	29	1.80E-05
0.0435	6.05153	288.327	0.08695	1.1829	29	1.80E-05
0.0455	6.06431	288.3268	0.08732	1.1829	29	1.80E-05
0.048	6.04486	288.3487	0.08675	1.1828	29	1.80E-05
0.05	6.09491	288.3666	0.08819	1.1827	29	1.80E-05
0.0545	6.15926	288.358	0.09006	1.1827	29	1.80E-05
0.06	6.24715	288.3715	0.09264	1.1827	29	1.80E-05
0.0645	6.33311	288.3561	0.09522	1.1827	29	1.80E-05
0.07	6.38449	288.3407	0.09677	1.1828	29	1.80E-05
0.0745	6.45536	288.3362	0.09894	1.1828	29	1.80E-05
0.08	6.49773	288.3268	0.10024	1.1829	29	1.80E-05
0.0845	6.56533	288.3477	0.10233	1.1828	29	1.80E-05
0.09	6.7185	288.3286	0.10717	1.1828	29	1.80E-05
0.0945	6.70216	288.3428	0.10664	1.1828	29	1.80E-05
0.1	6.6591	288.3594	0.10527	1.1827	29	1.80E-05
0.1105	6.73065	288.3403	0.10755	1.1828	29	1.80E-05
0.12	6.80942	288.3518	0.11008	1.1827	29	1.80E-05
0.13	6.81393	288.3272	0.11024	1.1829	29	1.80E-05
0.14	6.92846	288.335	0.11397	1.1828	29	1.80E-05
0.15	7.03691	288.3149	0.11757	1.1829	29	1.80E-05
0.16	7.08535	288.3299	0.11919	1.1828	29	1.80E-05
0.17	7.20499	288.3141	0.12326	1.1829	29	1.80E-05
0.18	7.17778	288.3422	0.12232	1.1828	29	1.80E-05
0.19	7.25434	288.3094	0.12495	1.1829	29	1.80E-05
0.2	7.29137	288.325	0.12623	1.1829	29	1.80E-05
0.2245	7.43411	288.3204	0.13122	1.1829	29	1.80E-05
0.25	7.51041	288.3272	0.13392	1.1829	29	1.80E-05

0.2745	7.60318	288.3323	0.13725	1.1828	29	1.80E-05
0.3	7.72517	288.3268	0.14169	1.1829	29	1.80E-05
0.3245	7.77697	288.3077	0.14361	1.1829	29	1.80E-05
0.35	7.96008	288.3157	0.15045	1.1829	29	1.80E-05
0.374	8.00189	288.3202	0.15203	1.1829	29	1.80E-05
0.3995	8.07443	288.3393	0.15479	1.1828	29	1.80E-05
0.424	8.09378	288.3325	0.15553	1.1828	29	1.80E-05
0.45	8.32711	288.326	0.16463	1.1829	29	1.80E-05
0.474	8.27504	288.327	0.16258	1.1829	29	1.80E-05
0.4995	8.39293	288.3192	0.16725	1.1829	29	1.80E-05
0.524	8.514	288.2745	0.17214	1.1831	29	1.80E-05
0.5495	8.58067	288.2868	0.17484	1.183	29	1.80E-05
0.574	8.66319	288.2868	0.17822	1.183	29	1.80E-05
0.599	8.77709	288.2925	0.18293	1.183	29	1.80E-05
0.6495	8.90854	288.301	0.18844	1.183	29	1.80E-05
0.699	9.00134	288.2833	0.1924	1.183	29	1.80E-05
0.749	9.17006	288.28	0.19969	1.1831	29	1.80E-05
0.7985	9.25949	288.2745	0.2036	1.1831	29	1.80E-05
0.849	9.4514	288.2784	0.21213	1.1831	29	1.80E-05
0.8985	9.56093	288.278	0.21707	1.1831	29	1.80E-05
0.9485	9.71588	288.2624	0.22418	1.1831	29	1.80E-05
0.998	9.84975	288.2655	0.2304	1.1831	29	1.80E-05
1.0485	9.82524	288.237	0.22928	1.1832	29	1.80E-05
1.098	10.00441	288.2558	0.2377	1.1832	29	1.80E-05
1.148	10.06815	288.2517	0.24074	1.1832	29	1.80E-05
1.1975	10.16919	288.2696	0.24558	1.1831	29	1.80E-05
1.2725	10.34018	288.278	0.2539	1.1831	29	1.80E-05
1.3475	10.45112	288.2722	0.25938	1.1831	29	1.80E-05
1.422	10.57511	288.3061	0.26554	1.1829	29	1.80E-05
1.4965	10.65349	288.2862	0.26951	1.183	29	1.80E-05
1.572	10.75402	288.3159	0.27459	1.1829	29	1.80E-05
1.6465	10.84223	288.3301	0.2791	1.1828	29	1.80E-05
1.7215	10.90373	288.3108	0.28229	1.1829	29	1.80E-05
1.796	10.99783	288.3239	0.28717	1.1829	29	1.80E-05
1.871	11.05428	288.2921	0.29016	1.183	29	1.80E-05
1.945	11.09746	288.2936	0.29243	1.183	29	1.80E-05
2.0205	11.13341	288.2845	0.29434	1.183	29	1.80E-05
2.095	11.20474	288.3012	0.29811	1.183	29	1.80E-05
2.1705	11.2248	288.2971	0.29918	1.183	29	1.80E-05
2.2445	11.23129	288.294	0.29953	1.183	29	1.80E-05
2.3195	11.26082	288.27	0.30113	1.1831	29	1.80E-05
2.394	11.27931	288.2845	0.30211	1.183	29	1.80E-05
2.4695	11.29571	288.2858	0.30298	1.183	29	1.80E-05
2.5435	11.29969	288.2731	0.30321	1.1831	29	1.80E-05
2.6185	11.30989	288.2718	0.30376	1.1831	29	1.80E-05
2.6935	11.32398	288.2723	0.30452	1.1831	29	1.80E-05
2.7685	11.31711	288.2458	0.30418	1.1832	29	1.80E-05
2.843	11.3336	288.2729	0.30503	1.1831	29	1.80E-05
2.9175	11.33391	288.2597	0.30507	1.1831	29	1.80E-05
2.9925	11.38978	288.2817	0.30806	1.183	29	1.80E-05
3.0925	11.36556	288.2813	0.30675	1.1831	29	1.80E-05
3.1925	11.38621	288.2665	0.30788	1.1831	29	1.80E-05
3.292	11.37858	288.2368	0.3075	1.1832	29	1.80E-05
3.392	11.36406	288.2521	0.3067	1.1832	29	1.80E-05
3.492	11.35539	288.2072	0.30628	1.1834	29	1.80E-05
3.5915	11.37402	288.1705	0.30733	1.1835	29	1.79E-05
3.6915	11.35921	288.1277	0.30658	1.1837	29	1.79E-05
3.7915	11.36928	288.0826	0.30717	1.1839	29	1.79E-05

10/2/00	2:30 PM	LEC				
Rel Humidi	49					
y (cm)	Vmean (m/	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.001	3.91677	288.438	0.03641	1.1824	29	1.80E-05
0.002	4.01591	288.4593	0.03827	1.1823	29	1.80E-05
0.003	4.11806	288.4382	0.04025	1.1824	29	1.80E-05
0.004	4.01308	288.424	0.03822	1.1824	29	1.80E-05
0.0045	4.0567	288.4854	0.03905	1.1822	29	1.80E-05
0.0055	4.17475	288.4503	0.04136	1.1823	29	1.80E-05
0.007	4.23867	288.4488	0.04264	1.1823	29	1.80E-05
0.008	4.32685	288.4484	0.04443	1.1823	29	1.80E-05
0.0095	4.47098	288.4574	0.04744	1.1823	29	1.80E-05
0.0105	4.51928	288.4675	0.04847	1.1822	29	1.80E-05
0.0115	4.69815	288.4542	0.05238	1.1823	29	1.80E-05
0.012	4.71025	288.4562	0.05265	1.1823	29	1.80E-05
0.013	4.75998	288.4698	0.05377	1.1822	29	1.80E-05
0.014	5.03419	288.4591	0.06014	1.1823	29	1.80E-05
0.0145	5.09344	288.4671	0.06156	1.1822	29	1.80E-05
0.0155	5.09771	288.4837	0.06166	1.1822	29	1.80E-05
0.018	5.19843	288.4856	0.06412	1.1822	29	1.80E-05
0.02	5.38383	288.4849	0.06878	1.1822	29	1.80E-05
0.022	5.51138	288.4942	0.07207	1.1821	29	1.80E-05
0.0235	5.61489	288.4847	0.07481	1.1822	29	1.80E-05
0.0255	5.80284	288.5135	0.07989	1.182	29	1.80E-05
0.028	5.93766	288.4934	0.08366	1.1821	29	1.80E-05
0.0305	5.93583	288.4683	0.08361	1.1822	29	1.80E-05
0.032	6.10958	288.4724	0.08858	1.1822	29	1.80E-05
0.034	6.1944	288.4931	0.09105	1.1821	29	1.80E-05
0.0355	6.21791	288.4895	0.09174	1.1821	29	1.80E-05
0.038	6.3569	288.4987	0.09588	1.1821	29	1.80E-05
0.04	6.44258	288.5069	0.09848	1.1821	29	1.80E-05
0.042	6.51417	288.5206	0.10068	1.182	29	1.80E-05
0.0435	6.53804	288.4876	0.10143	1.1822	29	1.80E-05
0.0455	6.64589	288.4895	0.1048	1.1821	29	1.80E-05
0.048	6.61162	288.422	0.10375	1.1824	29	1.80E-05
0.0505	6.73093	288.3811	0.10755	1.1826	29	1.80E-05
0.0545	6.8242	288.3235	0.11057	1.1829	29	1.80E-05
0.06	6.91959	288.2763	0.1137	1.1831	29	1.80E-05
0.0645	7.12265	288.2376	0.12049	1.1832	29	1.80E-05
0.0705	7.11476	288.2117	0.12024	1.1834	29	1.80E-05
0.075	7.19083	288.1933	0.12283	1.1834	29	1.79E-05
0.08	7.36191	288.1978	0.12874	1.1834	29	1.79E-05
0.0845	7.32459	288.1771	0.12745	1.1835	29	1.79E-05
0.0905	7.40103	288.172	0.13012	1.1835	29	1.79E-05
0.0945	7.4797	288.1828	0.1329	1.1835	29	1.79E-05
0.1	7.61249	288.1785	0.13766	1.1835	29	1.79E-05
0.1105	7.57092	288.1621	0.13617	1.1836	29	1.79E-05
0.12	7.69083	288.1463	0.14053	1.1836	29	1.79E-05
0.1305	7.82432	288.1636	0.14544	1.1836	29	1.79E-05
0.14	7.85054	288.1472	0.14642	1.1836	29	1.79E-05
0.1505	7.93437	288.1451	0.14957	1.1836	29	1.79E-05
0.16	7.97863	288.1572	0.15124	1.1836	29	1.79E-05
0.1705	7.97478	288.1781	0.15108	1.1835	29	1.79E-05
0.18	8.06006	288.1578	0.15434	1.1836	29	1.79E-05
0.1905	8.11639	288.1492	0.15651	1.1836	29	1.79E-05
0.2	8.14262	288.1365	0.15753	1.1837	29	1.79E-05
0.2245	8.30356	288.1314	0.16382	1.1837	29	1.79E-05
0.2505	8.38374	288.1465	0.16699	1.1836	29	1.79E-05

0.2745	8.43544	288.1673	0.16904	1.1835	29	1.79E-05
0.3	8.53725	288.1517	0.17316	1.1836	29	1.79E-05
0.3245	8.65767	288.1441	0.17808	1.1836	29	1.79E-05
0.3505	8.70802	288.1322	0.18017	1.1837	29	1.79E-05
0.3745	8.80857	288.1369	0.18435	1.1837	29	1.79E-05
0.4	8.94597	288.1599	0.19013	1.1836	29	1.79E-05
0.4245	8.93118	288.1472	0.18951	1.1836	29	1.79E-05
0.45	9.02253	288.1371	0.19341	1.1837	29	1.79E-05
0.4745	9.08218	288.131	0.19598	1.1837	29	1.79E-05
0.5	9.17486	288.133	0.2	1.1837	29	1.79E-05
0.5245	9.23723	288.1504	0.20272	1.1836	29	1.79E-05
0.55	9.34134	288.1387	0.20732	1.1837	29	1.79E-05
0.5745	9.34493	288.1377	0.20748	1.1837	29	1.79E-05
0.5995	9.44113	288.1463	0.21177	1.1836	29	1.79E-05
0.65	9.57357	288.15	0.21775	1.1836	29	1.79E-05
0.6995	9.62802	288.1289	0.22025	1.1837	29	1.79E-05
0.7495	9.81639	288.1264	0.22896	1.1837	29	1.79E-05
0.799	9.90514	288.1234	0.23312	1.1837	29	1.79E-05
0.8495	9.98655	288.1242	0.23696	1.1837	29	1.79E-05
0.899	10.13042	288.1115	0.24385	1.1838	29	1.79E-05
0.949	10.21857	288.1045	0.24812	1.1838	29	1.79E-05
0.9985	10.28949	288.1072	0.25157	1.1838	29	1.79E-05
1.049	10.40066	288.0941	0.25705	1.1839	29	1.79E-05
1.0985	10.44194	288.0897	0.2591	1.1839	29	1.79E-05
1.1485	10.53841	288.0949	0.26391	1.1839	29	1.79E-05
1.198	10.62922	288.0951	0.26847	1.1839	29	1.79E-05
1.273	10.71639	288.0703	0.27292	1.184	29	1.79E-05
1.348	10.84186	288.0891	0.27933	1.1839	29	1.79E-05
1.4225	10.90578	288.069	0.28265	1.184	29	1.79E-05
1.497	11.02647	288.0902	0.28892	1.1839	29	1.79E-05
1.5725	11.0436	288.0986	0.28981	1.1838	29	1.79E-05
1.647	11.12625	288.052	0.29421	1.1841	29	1.79E-05
1.722	11.1778	288.0666	0.29693	1.184	29	1.79E-05
1.796	11.2414	288.0703	0.30032	1.184	29	1.79E-05
1.872	11.28894	288.0719	0.30286	1.184	29	1.79E-05
1.946	11.31812	288.0631	0.30444	1.184	29	1.79E-05
2.021	11.34321	288.0822	0.30577	1.1839	29	1.79E-05
2.0955	11.38141	288.0576	0.30786	1.184	29	1.79E-05
2.171	11.4312	288.0592	0.31056	1.184	29	1.79E-05
2.2455	11.37928	288.0645	0.30773	1.184	29	1.79E-05
2.3205	11.45961	288.0387	0.31212	1.1841	29	1.79E-05
2.395	11.42617	288.035	0.31031	1.1841	29	1.79E-05
2.4705	11.45102	288.0777	0.31161	1.1839	29	1.79E-05
2.5445	11.4175	288.0354	0.30984	1.1841	29	1.79E-05
2.6195	11.41901	288.069	0.30988	1.184	29	1.79E-05
2.694	11.40901	288.0518	0.30936	1.1841	29	1.79E-05
2.7695	11.40994	288.0549	0.30941	1.184	29	1.79E-05
2.8435	11.39208	288.025	0.30847	1.1842	29	1.79E-05
2.919	11.41119	288.0213	0.30951	1.1842	29	1.79E-05
2.9935	11.37327	288.0375	0.30744	1.1841	29	1.79E-05
3.0935	11.39435	288.0364	0.30858	1.1841	29	1.79E-05
3.193	11.38122	288.0383	0.30787	1.1841	29	1.79E-05
3.293	11.37556	288.0375	0.30756	1.1841	29	1.79E-05
3.3925	11.41291	288.0239	0.3096	1.1842	29	1.79E-05
3.4925	11.38633	288.0444	0.30814	1.1841	29	1.79E-05
3.5925	11.4073	288.0444	0.30927	1.1841	29	1.79E-05
3.692	11.42257	288.0606	0.31008	1.184	29	1.79E-05
3.792	11.39127	288.0381	0.30841	1.1841	29	1.79E-05

10/2/00 3:37 PM		TEC				
Rel Humidi 49						
y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.001	3.51812	288.3713	0.02938	1.1827	29	1.80E-05
0.002	3.42425	288.3418	0.02784	1.1828	29	1.80E-05
0.003	3.40497	288.3551	0.02752	1.1827	29	1.80E-05
0.0045	3.44756	288.3129	0.02822	1.1829	29	1.80E-05
0.0055	3.52473	288.3188	0.0295	1.1829	29	1.80E-05
0.0065	3.59462	288.2759	0.03068	1.1831	29	1.80E-05
0.0075	3.73017	288.2384	0.03305	1.1832	29	1.80E-05
0.0085	3.8411	288.2079	0.03505	1.1834	29	1.80E-05
0.009	3.89948	288.1515	0.03613	1.1836	29	1.79E-05
0.01	4.03077	288.159	0.0386	1.1836	29	1.79E-05
0.011	4.20843	288.1043	0.04208	1.1838	29	1.79E-05
0.012	4.25403	288.0754	0.04301	1.1839	29	1.79E-05
0.013	4.32678	288.0731	0.04449	1.184	29	1.79E-05
0.014	4.40847	288.077	0.04619	1.1839	29	1.79E-05
0.0155	4.49346	288.0524	0.04799	1.184	29	1.79E-05
0.0165	4.56661	288.0574	0.04956	1.184	29	1.79E-05
0.0185	4.73028	288.0664	0.05318	1.184	29	1.79E-05
0.02	4.87266	288.0516	0.05643	1.1841	29	1.79E-05
0.022	5.03476	288.0725	0.06024	1.184	29	1.79E-05
0.0245	5.18646	288.0838	0.06392	1.1839	29	1.79E-05
0.027	5.29925	288.0914	0.06673	1.1839	29	1.79E-05
0.0285	5.29824	288.0736	0.06671	1.184	29	1.79E-05
0.03	5.33503	288.0532	0.06765	1.184	29	1.79E-05
0.032	5.5832	288.0688	0.07408	1.184	29	1.79E-05
0.034	5.54474	288.0709	0.07306	1.184	29	1.79E-05
0.0365	5.6593	288.0578	0.07612	1.184	29	1.79E-05
0.038	5.67499	288.051	0.07654	1.1841	29	1.79E-05
0.04	5.64304	288.0551	0.07568	1.184	29	1.79E-05
0.042	5.729	288.0461	0.07801	1.1841	29	1.79E-05
0.0445	5.81498	288.0412	0.08037	1.1841	29	1.79E-05
0.0465	5.93293	288.0502	0.08366	1.1841	29	1.79E-05
0.0485	5.96341	288.034	0.08452	1.1841	29	1.79E-05
0.05	6.01747	288.0207	0.08607	1.1842	29	1.79E-05
0.0555	6.13572	288.0295	0.08948	1.1841	29	1.79E-05
0.06	6.17762	288.0323	0.09071	1.1841	29	1.79E-05
0.0655	6.21933	288.0457	0.09193	1.1841	29	1.79E-05
0.07	6.25596	288.0385	0.09302	1.1841	29	1.79E-05
0.0755	6.35194	288.0006	0.09591	1.1843	29	1.79E-05
0.08	6.38749	287.9915	0.09699	1.1843	29	1.79E-05
0.0855	6.43207	287.9712	0.09836	1.1844	29	1.79E-05
0.09	6.53311	287.9717	0.10147	1.1844	29	1.79E-05
0.0955	6.57378	288.0008	0.10273	1.1843	29	1.79E-05
0.1	6.60676	287.9721	0.10377	1.1844	29	1.79E-05
0.11	6.71052	287.9917	0.10705	1.1843	29	1.79E-05
0.12	6.79004	287.9848	0.1096	1.1843	29	1.79E-05
0.13	6.84127	287.9942	0.11126	1.1843	29	1.79E-05
0.14	6.93838	287.9803	0.11445	1.1844	29	1.79E-05
0.15	7.00866	287.954	0.11679	1.1845	29	1.79E-05
0.16	7.08139	287.9868	0.11921	1.1843	29	1.79E-05
0.17	7.07671	288.0096	0.11904	1.1842	29	1.79E-05
0.18	7.09418	287.9954	0.11964	1.1843	29	1.79E-05
0.19	7.16486	288.0067	0.12203	1.1842	29	1.79E-05
0.2	7.25846	287.993	0.12524	1.1843	29	1.79E-05
0.2255	7.3617	287.9819	0.12884	1.1844	29	1.79E-05
0.25	7.50071	287.9839	0.13375	1.1843	29	1.79E-05

0.275	7.62903	287.9975	0.13835	1.1843	29	1.79E-05
0.3	7.64667	287.9821	0.139	1.1844	29	1.79E-05
0.3255	7.80793	287.9745	0.14493	1.1844	29	1.79E-05
0.35	7.85556	287.9548	0.14672	1.1845	29	1.79E-05
0.375	7.92765	288.002	0.14939	1.1843	29	1.79E-05
0.4	8.07539	287.9764	0.15503	1.1844	29	1.79E-05
0.4255	8.12718	287.9766	0.15702	1.1844	29	1.79E-05
0.45	8.24162	287.9608	0.16149	1.1844	29	1.79E-05
0.475	8.3266	287.9555	0.16484	1.1845	29	1.79E-05
0.4995	8.43348	287.9774	0.16908	1.1844	29	1.79E-05
0.5255	8.47102	287.9965	0.17058	1.1843	29	1.79E-05
0.5495	8.52117	287.9926	0.17261	1.1843	29	1.79E-05
0.575	8.58784	288.0024	0.17531	1.1843	29	1.79E-05
0.5995	8.68468	288.0001	0.17929	1.1843	29	1.79E-05
0.6495	8.78362	288.0038	0.1834	1.1843	29	1.79E-05
0.6995	8.93667	288.0104	0.18984	1.1842	29	1.79E-05
0.7495	9.09811	288.0258	0.19675	1.1842	29	1.79E-05
0.799	9.24582	287.9983	0.20321	1.1843	29	1.79E-05
0.849	9.34719	288.0174	0.20767	1.1842	29	1.79E-05
0.899	9.45522	288.0083	0.21251	1.1842	29	1.79E-05
0.949	9.57873	287.9913	0.21811	1.1843	29	1.79E-05
0.999	9.68097	287.9704	0.22281	1.1844	29	1.79E-05
1.049	9.79587	287.9856	0.22812	1.1843	29	1.79E-05
1.0985	9.89887	287.9866	0.23294	1.1843	29	1.79E-05
1.1485	9.96773	287.9991	0.23618	1.1843	29	1.79E-05
1.1985	10.07874	288.01	0.24146	1.1842	29	1.79E-05
1.273	10.16521	288.0036	0.24563	1.1843	29	1.79E-05
1.348	10.28148	287.9909	0.25129	1.1843	29	1.79E-05
1.4225	10.43899	288.0049	0.25904	1.1843	29	1.79E-05
1.4975	10.51555	287.9819	0.26287	1.1844	29	1.79E-05
1.572	10.65423	288.0202	0.26981	1.1842	29	1.79E-05
1.6475	10.70769	288.0465	0.2725	1.1841	29	1.79E-05
1.7215	10.77105	288.1002	0.27568	1.1838	29	1.79E-05
1.797	10.89571	288.1396	0.28206	1.1837	29	1.79E-05
1.871	10.92383	288.1867	0.28347	1.1835	29	1.79E-05
1.9465	11.00165	288.2048	0.2875	1.1834	29	1.80E-05
2.0205	11.00721	288.2446	0.28775	1.1832	29	1.80E-05
2.096	11.06028	288.2417	0.29053	1.1832	29	1.80E-05
2.1705	11.16505	288.2651	0.29604	1.1831	29	1.80E-05
2.246	11.14371	288.2989	0.29487	1.183	29	1.80E-05
2.32	11.21835	288.2907	0.29884	1.183	29	1.80E-05
2.3955	11.25183	288.3116	0.30061	1.1829	29	1.80E-05
2.4695	11.23002	288.3151	0.29944	1.1829	29	1.80E-05
2.545	11.26682	288.3077	0.30141	1.1829	29	1.80E-05
2.619	11.23256	288.2934	0.2996	1.183	29	1.80E-05
2.694	11.25817	288.2868	0.30097	1.183	29	1.80E-05
2.769	11.26335	288.2995	0.30124	1.183	29	1.80E-05
2.844	11.27984	288.2993	0.30212	1.183	29	1.80E-05
2.9185	11.29882	288.3008	0.30313	1.183	29	1.80E-05
2.993	11.31332	288.3223	0.30389	1.1829	29	1.80E-05
3.0925	11.28574	288.3317	0.3024	1.1828	29	1.80E-05
3.1925	11.30567	288.2966	0.30351	1.183	29	1.80E-05
3.292	11.33064	288.3141	0.30483	1.1829	29	1.80E-05
3.392	11.32554	288.3135	0.30456	1.1829	29	1.80E-05
3.4915	11.34589	288.3135	0.30565	1.1829	29	1.80E-05
3.5915	11.31013	288.3178	0.30372	1.1829	29	1.80E-05
3.691	11.29285	288.3336	0.30278	1.1828	29	1.80E-05
3.791	11.32312	288.3375	0.3044	1.1828	29	1.80E-05

10/2/00	2:48 PM	7			
Rel Humidi	49				
y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg Patm ("Hg)	viscosity (kg/ms)
0.0005	3.32649	288.4201	0.02626	1.1824	29 1.80E-05
0.0015	3.4737	288.4012	0.02864	1.1825	29 1.80E-05
0.0025	3.40933	288.3994	0.02759	1.1825	29 1.80E-05
0.0035	3.62912	288.3922	0.03126	1.1826	29 1.80E-05
0.0045	3.61809	288.4127	0.03107	1.1825	29 1.80E-05
0.0055	3.67332	288.4322	0.03202	1.1824	29 1.80E-05
0.007	3.79553	288.4538	0.03419	1.1823	29 1.80E-05
0.008	3.83915	288.4517	0.03498	1.1823	29 1.80E-05
0.009	3.90813	288.4304	0.03625	1.1824	29 1.80E-05
0.01	4.00551	288.4099	0.03808	1.1825	29 1.80E-05
0.011	4.12379	288.4283	0.04036	1.1824	29 1.80E-05
0.0115	4.19727	288.4164	0.04181	1.1825	29 1.80E-05
0.0125	4.33429	288.4542	0.04458	1.1823	29 1.80E-05
0.0135	4.39242	288.4296	0.04579	1.1824	29 1.80E-05
0.0145	4.50586	288.4199	0.04819	1.1824	29 1.80E-05
0.0155	4.62792	288.4384	0.05083	1.1824	29 1.80E-05
0.0175	4.82449	288.4162	0.05524	1.1825	29 1.80E-05
0.0195	4.99677	288.4164	0.05926	1.1825	29 1.80E-05
0.0215	5.2035	288.4316	0.06426	1.1824	29 1.80E-05
0.0235	5.37678	288.432	0.06861	1.1824	29 1.80E-05
0.0255	5.47426	288.4339	0.07112	1.1824	29 1.80E-05
0.028	5.63795	288.4203	0.07544	1.1824	29 1.80E-05
0.03	5.76503	288.4097	0.07889	1.1825	29 1.80E-05
0.0315	5.9452	288.4066	0.08389	1.1825	29 1.80E-05
0.033	5.99707	288.4238	0.08536	1.1824	29 1.80E-05
0.0355	6.1143	288.3971	0.08874	1.1825	29 1.80E-05
0.0375	6.20932	288.4273	0.09151	1.1824	29 1.80E-05
0.0395	6.30438	288.3729	0.09435	1.1827	29 1.80E-05
0.0415	6.42548	288.3912	0.098	1.1826	29 1.80E-05
0.0435	6.56276	288.4052	0.10223	1.1825	29 1.80E-05
0.0455	6.55215	288.4107	0.1019	1.1825	29 1.80E-05
0.048	6.59541	288.431	0.10324	1.1824	29 1.80E-05
0.05	6.70742	288.4051	0.10679	1.1825	29 1.80E-05
0.054	6.74858	288.3941	0.1081	1.1826	29 1.80E-05
0.0595	6.89426	288.4205	0.11281	1.1824	29 1.80E-05
0.0645	7.04515	288.3932	0.11782	1.1826	29 1.80E-05
0.07	7.11193	288.408	0.12005	1.1825	29 1.80E-05
0.0745	7.24331	288.4339	0.12452	1.1824	29 1.80E-05
0.0795	7.33947	288.4412	0.12784	1.1824	29 1.80E-05
0.0845	7.38944	288.4378	0.12959	1.1824	29 1.80E-05
0.09	7.45745	288.4673	0.13197	1.1822	29 1.80E-05
0.0945	7.48642	288.4585	0.133	1.1823	29 1.80E-05
0.1	7.54362	288.4316	0.13506	1.1824	29 1.80E-05
0.11	7.64795	288.4445	0.13881	1.1823	29 1.80E-05
0.1195	7.74131	288.4542	0.14222	1.1823	29 1.80E-05
0.13	7.8146	288.447	0.14493	1.1823	29 1.80E-05
0.1395	7.85872	288.4646	0.14656	1.1823	29 1.80E-05
0.15	7.92649	288.4281	0.14912	1.1824	29 1.80E-05
0.1595	7.99093	288.4597	0.15153	1.1823	29 1.80E-05
0.17	8.07419	288.4671	0.1547	1.1822	29 1.80E-05
0.1795	8.11277	288.4566	0.15619	1.1823	29 1.80E-05
0.19	8.17842	288.4445	0.15874	1.1823	29 1.80E-05
0.1995	8.24017	288.4579	0.16113	1.1823	29 1.80E-05
0.2245	8.33678	288.4476	0.16494	1.1823	29 1.80E-05
0.25	8.46984	288.4398	0.17025	1.1824	29 1.80E-05

0.274	8.58554	288.4583	0.17492	1.1823	29	1.80E-05
0.2995	8.6464	288.4447	0.17742	1.1823	29	1.80E-05
0.3245	8.75577	288.4236	0.18195	1.1824	29	1.80E-05
0.35	8.79651	288.4388	0.18364	1.1824	29	1.80E-05
0.374	8.86025	288.4213	0.18632	1.1824	29	1.80E-05
0.3995	8.97804	288.399	0.19133	1.1825	29	1.80E-05
0.4245	9.03905	288.4179	0.19392	1.1825	29	1.80E-05
0.45	9.18087	288.3777	0.20008	1.1826	29	1.80E-05
0.474	9.19244	288.401	0.20057	1.1825	29	1.80E-05
0.4995	9.31648	288.3994	0.20602	1.1825	29	1.80E-05
0.524	9.33032	288.4082	0.20663	1.1825	29	1.80E-05
0.55	9.45271	288.401	0.21209	1.1825	29	1.80E-05
0.574	9.5019	288.3881	0.21431	1.1826	29	1.80E-05
0.5995	9.59013	288.3982	0.2183	1.1825	29	1.80E-05
0.65	9.69489	288.3955	0.2231	1.1826	29	1.80E-05
0.6995	9.84036	288.4029	0.22984	1.1825	29	1.80E-05
0.7495	9.99711	288.3953	0.23723	1.1826	29	1.80E-05
0.7995	10.11371	288.3953	0.24279	1.1826	29	1.80E-05
0.8495	10.2315	288.4117	0.24847	1.1825	29	1.80E-05
0.899	10.36871	288.4111	0.25518	1.1825	29	1.80E-05
0.9495	10.46198	288.3908	0.25981	1.1826	29	1.80E-05
0.999	10.5422	288.3875	0.26381	1.1826	29	1.80E-05
1.049	10.66424	288.374	0.26997	1.1826	29	1.80E-05
1.099	10.7277	288.4021	0.27316	1.1825	29	1.80E-05
1.149	10.87424	288.3779	0.2807	1.1826	29	1.80E-05
1.1985	10.94556	288.3625	0.28441	1.1827	29	1.80E-05
1.273	11.07984	288.3785	0.29141	1.1826	29	1.80E-05
1.3485	11.14005	288.4015	0.29457	1.1825	29	1.80E-05
1.4225	11.25071	288.3885	0.30046	1.1826	29	1.80E-05
1.498	11.34643	288.3891	0.30559	1.1826	29	1.80E-05
1.5725	11.41216	288.3887	0.30915	1.1826	29	1.80E-05
1.648	11.45168	288.4197	0.31126	1.1824	29	1.80E-05
1.722	11.48526	288.4131	0.31309	1.1825	29	1.80E-05
1.7975	11.54616	288.414	0.31642	1.1825	29	1.80E-05
1.872	11.51871	288.3574	0.31498	1.1827	29	1.80E-05
1.947	11.52021	288.3842	0.31503	1.1826	29	1.80E-05
2.0215	11.49842	288.3982	0.31383	1.1825	29	1.80E-05
2.0965	11.55154	288.374	0.31676	1.1826	29	1.80E-05
2.1715	11.51258	288.3799	0.31462	1.1826	29	1.80E-05
2.2465	11.54436	288.3528	0.31639	1.1827	29	1.80E-05
2.321	11.54751	288.3563	0.31656	1.1827	29	1.80E-05
2.3955	11.54447	288.3844	0.31636	1.1826	29	1.80E-05
2.471	11.54288	288.3781	0.31628	1.1826	29	1.80E-05
2.5455	11.55978	288.3791	0.31721	1.1826	29	1.80E-05
2.6205	11.55779	288.3652	0.31711	1.1827	29	1.80E-05
2.695	11.56563	288.3859	0.31752	1.1826	29	1.80E-05
2.7705	11.55927	288.3779	0.31718	1.1826	29	1.80E-05
2.8445	11.57694	288.3867	0.31814	1.1826	29	1.80E-05
2.9195	11.55037	288.341	0.31674	1.1828	29	1.80E-05
2.994	11.53646	288.3397	0.31597	1.1828	29	1.80E-05
3.094	11.51889	288.3338	0.31502	1.1828	29	1.80E-05
3.1935	11.53641	288.3405	0.31597	1.1828	29	1.80E-05
3.2935	11.53406	288.342	0.31584	1.1828	29	1.80E-05
3.393	11.51093	288.3496	0.31457	1.1828	29	1.80E-05
3.493	11.53337	288.3399	0.31581	1.1828	29	1.80E-05
3.5925	11.54985	288.3416	0.31671	1.1828	29	1.80E-05
3.6925	11.53818	288.3506	0.31606	1.1827	29	1.80E-05
3.7925	11.56805	288.3528	0.31769	1.1827	29	1.80E-05

10/2/00	3:16 PM	8				
Rel Humidi	49					
y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg Patm ("Hg)	viscosity (kg/ms)	
0.0005	3.64349	288.3537	0.03152	1.1827	29	1.80E-05
0.0015	3.61527	288.3332	0.03103	1.1828	29	1.80E-05
0.0025	3.62705	288.3563	0.03123	1.1827	29	1.80E-05
0.004	3.6993	288.3389	0.03249	1.1828	29	1.80E-05
0.005	3.68787	288.3455	0.03229	1.1828	29	1.80E-05
0.0065	3.82395	288.3414	0.03472	1.1828	29	1.80E-05
0.0075	3.90585	288.3145	0.03622	1.1829	29	1.80E-05
0.0085	4.11221	288.31	0.04015	1.1829	29	1.80E-05
0.0095	4.16282	288.2954	0.04115	1.183	29	1.80E-05
0.01	4.14213	288.3016	0.04074	1.183	29	1.80E-05
0.011	4.24846	288.3036	0.04286	1.183	29	1.80E-05
0.0115	4.35584	288.3087	0.04505	1.1829	29	1.80E-05
0.0125	4.42378	288.2735	0.04647	1.1831	29	1.80E-05
0.0135	4.45426	288.3211	0.04711	1.1829	29	1.80E-05
0.015	4.60167	288.32	0.05028	1.1829	29	1.80E-05
0.016	4.60301	288.3385	0.0503	1.1828	29	1.80E-05
0.018	4.70864	288.3707	0.05263	1.1827	29	1.80E-05
0.02	4.90223	288.3812	0.05705	1.1826	29	1.80E-05
0.022	5.01331	288.3846	0.05966	1.1826	29	1.80E-05
0.024	5.0674	288.3485	0.06096	1.1828	29	1.80E-05
0.0265	5.14622	288.3684	0.06287	1.1827	29	1.80E-05
0.0285	5.26645	288.3528	0.06584	1.1827	29	1.80E-05
0.03	5.39459	288.3754	0.06908	1.1826	29	1.80E-05
0.0315	5.4663	288.3781	0.07093	1.1826	29	1.80E-05
0.0335	5.45044	288.398	0.07051	1.1825	29	1.80E-05
0.036	5.46929	288.3777	0.07101	1.1826	29	1.80E-05
0.038	5.53736	288.3933	0.07278	1.1826	29	1.80E-05
0.04	5.58845	288.4127	0.07413	1.1825	29	1.80E-05
0.0415	5.5904	288.4318	0.07417	1.1824	29	1.80E-05
0.044	5.67479	288.3832	0.07644	1.1826	29	1.80E-05
0.0465	5.71641	288.3781	0.07757	1.1826	29	1.80E-05
0.0485	5.71957	288.3959	0.07765	1.1826	29	1.80E-05
0.05	5.7976	288.4093	0.07978	1.1825	29	1.80E-05
0.055	5.87739	288.4086	0.08199	1.1825	29	1.80E-05
0.06	5.9746	288.3906	0.08473	1.1826	29	1.80E-05
0.065	5.98821	288.4154	0.08511	1.1825	29	1.80E-05
0.07	6.09587	288.4152	0.0882	1.1825	29	1.80E-05
0.075	6.16492	288.4224	0.0902	1.1824	29	1.80E-05
0.08	6.17892	288.4093	0.09062	1.1825	29	1.80E-05
0.085	6.23519	288.4191	0.09227	1.1825	29	1.80E-05
0.09	6.31363	288.4051	0.09461	1.1825	29	1.80E-05
0.095	6.32367	288.4072	0.09492	1.1825	29	1.80E-05
0.1	6.40558	288.3781	0.0974	1.1826	29	1.80E-05
0.11	6.48867	288.3801	0.09994	1.1826	29	1.80E-05
0.12	6.56026	288.399	0.10215	1.1825	29	1.80E-05
0.13	6.71252	288.3822	0.10696	1.1826	29	1.80E-05
0.14	6.7352	288.3707	0.10769	1.1827	29	1.80E-05
0.15	6.83011	288.3814	0.11074	1.1826	29	1.80E-05
0.16	6.84567	288.3871	0.11124	1.1826	29	1.80E-05
0.17	6.98522	288.3748	0.11583	1.1826	29	1.80E-05
0.18	7.01099	288.376	0.11668	1.1826	29	1.80E-05
0.19	7.08756	288.3492	0.11926	1.1828	29	1.80E-05
0.2	7.12797	288.3762	0.12061	1.1826	29	1.80E-05
0.225	7.32644	288.3471	0.12743	1.1828	29	1.80E-05
0.25	7.40724	288.3691	0.13025	1.1827	29	1.80E-05

0.2745	7.49765	288.3746	0.13344	1.1826	29	1.80E-05
0.3	7.64651	288.3773	0.13879	1.1826	29	1.80E-05
0.325	7.75442	288.3834	0.14274	1.1826	29	1.80E-05
0.35	7.8773	288.3633	0.14731	1.1827	29	1.80E-05
0.3745	7.9799	288.4224	0.15114	1.1824	29	1.80E-05
0.3995	8.00742	288.4021	0.15219	1.1825	29	1.80E-05
0.425	8.20496	288.3978	0.1598	1.1825	29	1.80E-05
0.45	8.22733	288.3832	0.16068	1.1826	29	1.80E-05
0.4745	8.30849	288.4084	0.16385	1.1825	29	1.80E-05
0.4995	8.3565	288.3904	0.16576	1.1826	29	1.80E-05
0.525	8.51474	288.4006	0.17209	1.1825	29	1.80E-05
0.55	8.58594	288.416	0.17497	1.1825	29	1.80E-05
0.5745	8.66201	288.4144	0.17808	1.1825	29	1.80E-05
0.5995	8.72253	288.4275	0.18057	1.1824	29	1.80E-05
0.6495	8.89261	288.3994	0.1877	1.1825	29	1.80E-05
0.6995	9.0807	288.3939	0.19573	1.1826	29	1.80E-05
0.7495	9.24596	288.3879	0.20292	1.1826	29	1.80E-05
0.799	9.33226	288.4006	0.20672	1.1825	29	1.80E-05
0.8495	9.48018	288.4093	0.21332	1.1825	29	1.80E-05
0.899	9.61871	288.3994	0.21961	1.1825	29	1.80E-05
0.949	9.72918	288.3582	0.22471	1.1827	29	1.80E-05
0.999	9.81451	288.3475	0.22868	1.1828	29	1.80E-05
1.049	9.92728	288.336	0.23398	1.1828	29	1.80E-05
1.0985	10.06247	288.3524	0.24038	1.1827	29	1.80E-05
1.1485	10.22088	288.3202	0.24804	1.1829	29	1.80E-05
1.1985	10.26084	288.3487	0.24995	1.1828	29	1.80E-05
1.273	10.46846	288.3596	0.26016	1.1827	29	1.80E-05
1.3485	10.6059	288.351	0.26704	1.1827	29	1.80E-05
1.4225	10.73494	288.3651	0.27357	1.1827	29	1.80E-05
1.4975	10.82616	288.334	0.27827	1.1828	29	1.80E-05
1.572	10.91129	288.3449	0.28265	1.1828	29	1.80E-05
1.6475	11.01196	288.3771	0.28786	1.1826	29	1.80E-05
1.7215	11.13981	288.3518	0.29461	1.1827	29	1.80E-05
1.797	11.16349	288.349	0.29586	1.1828	29	1.80E-05
1.8715	11.25671	288.3481	0.30083	1.1828	29	1.80E-05
1.947	11.33298	288.3528	0.30491	1.1827	29	1.80E-05
2.021	11.37874	288.3613	0.30737	1.1827	29	1.80E-05
2.096	11.38788	288.3412	0.30789	1.1828	29	1.80E-05
2.171	11.43862	288.3506	0.31063	1.1827	29	1.80E-05
2.2465	11.45925	288.3159	0.31179	1.1829	29	1.80E-05
2.3205	11.46241	288.3494	0.31192	1.1828	29	1.80E-05
2.3955	11.47311	288.3623	0.31249	1.1827	29	1.80E-05
2.4705	11.47241	288.3311	0.31249	1.1828	29	1.80E-05
2.5455	11.48642	288.3543	0.31322	1.1827	29	1.80E-05
2.62	11.49681	288.3686	0.31377	1.1827	29	1.80E-05
2.695	11.49518	288.3631	0.31369	1.1827	29	1.80E-05
2.77	11.49142	288.3637	0.31348	1.1827	29	1.80E-05
2.8445	11.50099	288.3781	0.31399	1.1826	29	1.80E-05
2.9195	11.48992	288.3693	0.3134	1.1827	29	1.80E-05
2.994	11.49216	288.36	0.31353	1.1827	29	1.80E-05
3.0935	11.50834	288.3908	0.31438	1.1826	29	1.80E-05
3.193	11.49187	288.3797	0.31349	1.1826	29	1.80E-05
3.2925	11.50177	288.3777	0.31403	1.1826	29	1.80E-05
3.392	11.51005	288.3887	0.31447	1.1826	29	1.80E-05
3.492	11.49154	288.3732	0.31348	1.1827	29	1.80E-05
3.592	11.5029	288.3978	0.31407	1.1825	29	1.80E-05
3.6915	11.54751	288.3852	0.31653	1.1826	29	1.80E-05
3.7915	11.50743	288.4004	0.31432	1.1825	29	1.80E-05

Representative Leading Edge Values				delta99 =	2.0175	
Cf =	0.005178			Uinf =	11.4982	U* = 0.585054
y	u	y/delta99	u/Uinf	y+	u+	
0.001	3.94069	0.000496	0.342722	3.85E-01	6.735602	
0.0015	3.989	0.000743	0.346924	5.78E-01	6.818175	
0.0025	4.07904	0.001239	0.354755	9.63E-01	6.972075	
0.0035	4.07894	0.001735	0.354746	1.35E+00	6.971905	
0.005	4.14819	0.002478	0.360769	1.93E+00	7.09027	
0.006	4.28658	0.002974	0.372804	2.31E+00	7.326812	
0.007	4.33101	0.00347	0.376669	2.70E+00	7.402754	
0.0075	4.52165	0.003717	0.393249	2.89E+00	7.728604	
0.0085	4.59207	0.004213	0.399373	3.27E+00	7.848969	
0.0095	4.6664	0.004709	0.405837	3.66E+00	7.976017	
0.0105	4.79892	0.005204	0.417363	4.04E+00	8.202526	
0.0115	4.88494	0.0057	0.424844	4.43E+00	8.349555	
0.0125	4.91958	0.006196	0.427857	4.81E+00	8.408764	
0.0135	5.07333	0.006691	0.441228	5.20E+00	8.67156	
0.015	5.12806	0.007435	0.445988	5.78E+00	8.765107	
0.016	5.17589	0.007931	0.450148	6.16E+00	8.84686	
0.018	5.39841	0.008922	0.4695	6.93E+00	9.227201	
0.0195	5.52591	0.009665	0.480589	7.51E+00	9.44513	
0.0215	5.72566	0.010657	0.497961	8.28E+00	9.786551	
0.0235	5.80949	0.011648	0.505252	9.05E+00	9.929837	
0.026	5.9285	0.012887	0.515602	1.00E+01	10.13325	
0.0275	6.09724	0.013631	0.530278	1.06E+01	10.42167	
0.0295	6.16249	0.014622	0.535953	1.14E+01	10.5332	
0.0315	6.23342	0.015613	0.542121	1.21E+01	10.65444	
0.034	6.35857	0.016853	0.553006	1.31E+01	10.86835	
0.036	6.43461	0.017844	0.559619	1.39E+01	10.99832	
0.038	6.50157	0.018835	0.565442	1.46E+01	11.11277	
0.0395	6.59172	0.019579	0.573283	1.52E+01	11.26686	
0.0415	6.59735	0.02057	0.573772	1.60E+01	11.27648	
0.0435	6.6608	0.021561	0.579291	1.68E+01	11.38493	
0.046	6.79432	0.0228	0.590903	1.77E+01	11.61315	
0.0475	6.79904	0.023544	0.591313	1.83E+01	11.62122	
0.0495	6.88663	0.024535	0.598931	1.91E+01	11.77093	
0.0555	6.9807	0.027509	0.607112	2.14E+01	11.93172	
0.0595	7.11487	0.029492	0.618781	2.29E+01	12.16105	
0.065	7.19971	0.032218	0.62616	2.50E+01	12.30606	
0.0695	7.23397	0.034449	0.629139	2.68E+01	12.36462	
0.0755	7.31918	0.037423	0.63655	2.91E+01	12.51027	
0.0795	7.33785	0.039405	0.638174	3.06E+01	12.54218	
0.0845	7.49529	0.041884	0.651866	3.25E+01	12.81128	
0.0895	7.51121	0.044362	0.653251	3.45E+01	12.83849	
0.095	7.59847	0.047088	0.66084	3.66E+01	12.98764	
0.0995	7.67111	0.049318	0.667157	3.83E+01	13.1118	
0.1095	7.70979	0.054275	0.670521	4.22E+01	13.17791	
0.1195	7.78115	0.059232	0.676728	4.60E+01	13.29989	
0.129	7.84718	0.063941	0.68247	4.97E+01	13.41275	
0.1395	7.88834	0.069145	0.68605	5.37E+01	13.4831	

0.149	8.0164	0.073854	0.697187	5.74E+01	13.70199
0.159	8.08826	0.07881	0.703437	6.12E+01	13.82481
0.169	8.07693	0.083767	0.702452	6.51E+01	13.80545
0.179	8.15008	0.088724	0.708814	6.89E+01	13.93048
0.189	8.20993	0.09368	0.714019	7.28E+01	14.03278
0.199	8.26871	0.098637	0.719131	7.66E+01	14.13324
0.224	8.33409	0.111029	0.724817	8.63E+01	14.245
0.249	8.50433	0.12342	0.739623	9.59E+01	14.53598
0.274	8.57809	0.135812	0.746038	1.06E+02	14.66205
0.2985	8.66903	0.147955	0.753947	1.15E+02	14.81749
0.3235	8.75576	0.160347	0.76149	1.25E+02	14.96573
0.3485	8.83909	0.172739	0.768737	1.34E+02	15.10816
0.3735	8.95627	0.18513	0.778928	1.44E+02	15.30845
0.3985	8.99914	0.197522	0.782656	1.53E+02	15.38173
0.423	9.07391	0.209665	0.789159	1.63E+02	15.50953
0.448	9.13593	0.222057	0.794553	1.73E+02	15.61554
0.473	9.26222	0.234449	0.805537	1.82E+02	15.8314
0.498	9.35936	0.24684	0.813985	1.92E+02	15.99743
0.5225	9.38421	0.258984	0.816146	2.01E+02	16.03991
0.5475	9.43494	0.271375	0.820558	2.11E+02	16.12662
0.5725	9.5065	0.283767	0.826782	2.21E+02	16.24893
0.598	9.59434	0.296406	0.834421	2.30E+02	16.39907
0.6475	9.72607	0.320942	0.845878	2.49E+02	16.62423
0.6975	9.83736	0.345725	0.855557	2.69E+02	16.81445
0.747	9.88943	0.37026	0.860085	2.88E+02	16.90345
0.797	10.07712	0.395043	0.876408	3.07E+02	17.22426
0.8465	10.13511	0.419579	0.881452	3.26E+02	17.32338
0.8965	10.29456	0.444362	0.895319	3.45E+02	17.59592
0.946	10.39539	0.468897	0.904088	3.64E+02	17.76826
0.9965	10.45515	0.493928	0.909286	3.84E+02	17.8704
1.046	10.6066	0.518463	0.922457	4.03E+02	18.12927
1.0955	10.66136	0.542999	0.92722	4.22E+02	18.22287
1.145	10.75103	0.567534	0.935019	4.41E+02	18.37614
1.1955	10.84387	0.592565	0.943093	4.60E+02	18.53482
1.2695	10.97098	0.629244	0.954148	4.89E+02	18.75208
1.3445	11.11241	0.666419	0.966448	5.18E+02	18.99382
1.419	11.15801	0.703346	0.970414	5.47E+02	19.07176
1.494	11.2383	0.74052	0.977396	5.75E+02	19.209
1.568	11.31606	0.7772	0.984159	6.04E+02	19.34191
1.6425	11.37559	0.814126	0.989337	6.33E+02	19.44366
1.718	11.4091	0.851549	0.992251	6.62E+02	19.50094

Representative Trailing Edge Values

delta99 = 2.6185

Uinf = 11.3543 U* = 0.577732

Rex = 7.48E+05

Avg Cf = 0.005079

y	u	y/delta99	u/Uinf	y+	u+	Rex	Avg Cf
0.001	3.83841	0.000382	0.338058	3.81E-01	6.643929		
0.0015	3.96538	0.000573	0.34924	5.72E-01	6.863702		
0.0025	4.0783	0.000955	0.359186	9.53E-01	7.059156		
0.0035	4.22679	0.001337	0.372263	1.33E+00	7.316178		
0.0045	4.26774	0.001719	0.37587	1.72E+00	7.387059		
0.0055	4.4233	0.0021	0.38957	2.10E+00	7.656319		
0.0065	4.47376	0.002482	0.394015	2.48E+00	7.74366		
0.008	4.59407	0.003055	0.404611	3.05E+00	7.951906		
0.009	4.63357	0.003437	0.408089	3.43E+00	8.020276		
0.01	4.75044	0.003819	0.418382	3.81E+00	8.222567		
0.011	4.8568	0.004201	0.42775	4.19E+00	8.406667		
0.012	4.93661	0.004583	0.434779	4.57E+00	8.54481		
0.0125	4.97379	0.004774	0.438053	4.76E+00	8.609165		
0.0135	5.05196	0.005156	0.444938	5.15E+00	8.74447		
0.0145	5.04394	0.005538	0.444232	5.53E+00	8.730589		
0.0155	5.14523	0.005919	0.453153	5.91E+00	8.905912		
0.0175	5.19927	0.006683	0.457912	6.67E+00	8.99945		
0.02	5.30302	0.007638	0.467049	7.62E+00	9.179032		
0.0215	5.40921	0.008211	0.476402	8.20E+00	9.362837		
0.0235	5.48311	0.008975	0.48291	8.96E+00	9.490751		
0.0255	5.53632	0.009738	0.487597	9.72E+00	9.582852		
0.028	5.61433	0.010693	0.494467	1.07E+01	9.71788		
0.03	5.70144	0.011457	0.502139	1.14E+01	9.86866		
0.032	5.78101	0.012221	0.509147	1.22E+01	10.00639		
0.0335	5.82962	0.012794	0.513428	1.28E+01	10.09053		
0.0355	5.89935	0.013557	0.51957	1.35E+01	10.21122		
0.0375	5.91612	0.014321	0.521047	1.43E+01	10.24025		
0.04	5.93662	0.015276	0.522852	1.52E+01	10.27573		
0.0415	5.9552	0.015849	0.524489	1.58E+01	10.30789		
0.0435	6.05153	0.016613	0.532973	1.66E+01	10.47463		
0.0455	6.06431	0.017376	0.534098	1.73E+01	10.49675		
0.048	6.04486	0.018331	0.532385	1.83E+01	10.46309		
0.05	6.09491	0.019095	0.536793	1.91E+01	10.54972		
0.0545	6.15926	0.020813	0.542461	2.08E+01	10.6611		
0.06	6.24715	0.022914	0.550201	2.29E+01	10.81323		
0.0645	6.33311	0.024632	0.557772	2.46E+01	10.96202		
0.07	6.38449	0.026733	0.562297	2.67E+01	11.05096		
0.0745	6.45536	0.028451	0.568539	2.84E+01	11.17362		
0.08	6.49773	0.030552	0.57227	3.05E+01	11.24696		
0.0845	6.56533	0.03227	0.578224	3.22E+01	11.36397		
0.09	6.7185	0.034371	0.591714	3.43E+01	11.6291		
0.0945	6.70216	0.036089	0.590275	3.60E+01	11.60081		
0.1	6.6591	0.03819	0.586483	3.81E+01	11.52628		
0.1105	6.73065	0.0422	0.592784	4.21E+01	11.65013		
0.12	6.80942	0.045828	0.599722	4.57E+01	11.78647		
0.13	6.81393	0.049647	0.600119	4.96E+01	11.79428		
0.14	6.92846	0.053466	0.610206	5.34E+01	11.99252		

0.15	7.03691	0.057285	0.619757	5.72E+01	12.18023
0.16	7.08535	0.061104	0.624023	6.10E+01	12.26408
0.17	7.20499	0.064923	0.63456	6.48E+01	12.47116
0.18	7.17778	0.068742	0.632164	6.86E+01	12.42407
0.19	7.25434	0.072561	0.638907	7.24E+01	12.55658
0.2	7.29137	0.07638	0.642168	7.62E+01	12.62068
0.2245	7.43411	0.085736	0.65474	8.56E+01	12.86775
0.25	7.51041	0.095475	0.66146	9.53E+01	12.99982
0.2745	7.60318	0.104831	0.66963	1.05E+02	13.16039
0.3	7.72517	0.114569	0.680374	1.14E+02	13.37155
0.3245	7.77697	0.123926	0.684936	1.24E+02	13.46121
0.35	7.96008	0.133664	0.701063	1.33E+02	13.77815
0.374	8.00189	0.14283	0.704745	1.43E+02	13.85052
0.3995	8.07443	0.152568	0.711134	1.52E+02	13.97608
0.424	8.09378	0.161925	0.712838	1.62E+02	14.00958
0.45	8.32711	0.171854	0.733388	1.72E+02	14.41345
0.474	8.27504	0.18102	0.728802	1.81E+02	14.32332
0.4995	8.39293	0.190758	0.739185	1.90E+02	14.52738
0.524	8.514	0.200115	0.749848	2.00E+02	14.73694
0.5495	8.58067	0.209853	0.75572	2.09E+02	14.85234
0.574	8.66319	0.219209	0.762988	2.19E+02	14.99517
0.599	8.77709	0.228757	0.773019	2.28E+02	15.19232
0.6495	8.90854	0.248043	0.784596	2.48E+02	15.41985
0.699	9.00134	0.266947	0.792769	2.66E+02	15.58048
0.749	9.17006	0.286042	0.807629	2.85E+02	15.87252
0.7985	9.25949	0.304946	0.815505	3.04E+02	16.02731
0.849	9.4514	0.324231	0.832407	3.24E+02	16.35949
0.8985	9.56093	0.343135	0.842054	3.42E+02	16.54908
0.9485	9.71588	0.36223	0.8557	3.62E+02	16.81728
0.998	9.84975	0.381134	0.867491	3.80E+02	17.049
1.0485	9.82524	0.40042	0.865332	4.00E+02	17.00657
1.098	10.00441	0.419324	0.881112	4.19E+02	17.3167
1.148	10.06815	0.438419	0.886726	4.38E+02	17.42703
1.1975	10.16919	0.457323	0.895625	4.56E+02	17.60192
1.2725	10.34018	0.485965	0.910684	4.85E+02	17.89788
1.3475	10.45112	0.514608	0.920455	5.14E+02	18.08991
1.422	10.57511	0.543059	0.931375	5.42E+02	18.30453
1.4965	10.65349	0.57151	0.938278	5.70E+02	18.4402
1.572	10.75402	0.600344	0.947132	5.99E+02	18.6142
1.6465	10.84223	0.628795	0.954901	6.28E+02	18.76689
1.7215	10.90373	0.657437	0.960317	6.56E+02	18.87334
1.796	10.99783	0.685889	0.968605	6.85E+02	19.03622
1.871	11.05428	0.714531	0.973577	7.13E+02	19.13393
1.945	11.09746	0.742792	0.977379	7.41E+02	19.20867
2.0205	11.13341	0.771625	0.980546	7.70E+02	19.27089
2.095	11.20474	0.800076	0.986828	7.99E+02	19.39436
2.1705	11.2248	0.82891	0.988595	8.27E+02	19.42908
2.2445	11.23129	0.85717	0.989166	8.56E+02	19.44031
2.3195	11.26082	0.885812	0.991767	8.84E+02	19.49143

APPENDIX C

Fuel Deposit Panel Skin Friction Data

10/4/00	1:01 PM	1				
Rel Humidi	77					
y (cm)	Vmean (m/	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.0005	2.7249	287.828	0.0177	1.1878	29.121	1.79E-05
0.0015	2.79511	287.7927	0.01863	1.188	29.121	1.79E-05
0.002	2.79326	287.7786	0.01861	1.1881	29.121	1.79E-05
0.003	3.00945	287.7822	0.0216	1.1881	29.121	1.79E-05
0.0045	3.08824	287.7767	0.02274	1.1881	29.121	1.79E-05
0.0055	3.15891	287.7615	0.0238	1.1882	29.121	1.79E-05
0.007	3.31335	287.748	0.02618	1.1882	29.121	1.79E-05
0.008	3.41469	287.7816	0.02781	1.1881	29.121	1.79E-05
0.0085	3.53366	287.7802	0.02978	1.1881	29.121	1.79E-05
0.0095	3.66824	287.7456	0.03209	1.1882	29.121	1.79E-05
0.0105	3.75743	287.7519	0.03367	1.1882	29.121	1.79E-05
0.0115	3.89639	287.7415	0.03621	1.1882	29.121	1.79E-05
0.0125	4.03028	287.73	0.03874	1.1883	29.121	1.79E-05
0.0135	4.16487	287.7275	0.04137	1.1883	29.121	1.79E-05
0.0145	4.27375	287.7084	0.04357	1.1884	29.121	1.79E-05
0.016	4.44495	287.7357	0.04712	1.1883	29.121	1.79E-05
0.0185	4.60105	287.7373	0.05049	1.1883	29.121	1.79E-05
0.02	4.83549	287.7347	0.05577	1.1883	29.121	1.79E-05
0.0215	5.0316	287.7103	0.06039	1.1884	29.121	1.79E-05
0.0235	5.15155	287.7093	0.0633	1.1884	29.121	1.79E-05
0.026	5.29593	287.7089	0.0669	1.1884	29.121	1.79E-05
0.028	5.51177	287.7113	0.07247	1.1884	29.121	1.79E-05
0.0295	5.55284	287.7128	0.07355	1.1884	29.121	1.79E-05
0.0315	5.69599	287.7111	0.07739	1.1884	29.121	1.79E-05
0.0335	5.72274	287.731	0.07811	1.1883	29.121	1.79E-05
0.036	5.89572	287.7167	0.08291	1.1884	29.121	1.79E-05
0.038	5.94158	287.7455	0.0842	1.1882	29.121	1.79E-05
0.04	5.99642	287.7324	0.08576	1.1883	29.121	1.79E-05
0.0415	6.02809	287.7332	0.08667	1.1883	29.121	1.79E-05
0.0435	6.11511	287.7259	0.08919	1.1883	29.121	1.79E-05
0.0455	6.16216	287.763	0.09056	1.1881	29.121	1.79E-05
0.048	6.23492	287.7226	0.09272	1.1883	29.121	1.79E-05
0.0495	6.25982	287.666	0.09349	1.1886	29.121	1.79E-05
0.055	6.29281	287.6298	0.09449	1.1887	29.121	1.79E-05
0.06	6.4223	287.5933	0.09843	1.1889	29.121	1.79E-05
0.0645	6.52559	287.5625	0.10163	1.189	29.121	1.79E-05
0.0695	6.54044	287.5394	0.10211	1.1892	29.121	1.79E-05
0.0745	6.65222	287.5045	0.10564	1.1893	29.121	1.79E-05
0.0795	6.66713	287.4613	0.10613	1.1895	29.121	1.79E-05
0.0845	6.74574	287.4636	0.10865	1.1895	29.121	1.79E-05
0.0895	6.8263	287.45	0.11126	1.1896	29.121	1.79E-05
0.0945	6.809	287.4298	0.11071	1.1896	29.121	1.79E-05
0.0995	6.91405	287.4193	0.11416	1.1897	29.121	1.79E-05
0.1095	6.94818	287.4527	0.11527	1.1895	29.121	1.79E-05
0.1195	6.9963	287.4332	0.11688	1.1896	29.121	1.79E-05
0.1295	7.07849	287.4048	0.11966	1.1898	29.121	1.79E-05
0.1395	7.07998	287.4179	0.1197	1.1897	29.121	1.79E-05
0.1495	7.13035	287.4234	0.12141	1.1897	29.121	1.79E-05
0.1595	7.19846	287.4214	0.12374	1.1897	29.121	1.79E-05
0.169	7.29677	287.4025	0.12715	1.1898	29.121	1.79E-05
0.1795	7.33874	287.3974	0.12862	1.1898	29.121	1.79E-05
0.189	7.37317	287.3861	0.12984	1.1898	29.121	1.79E-05
0.1995	7.41331	287.3947	0.13125	1.1898	29.121	1.79E-05
0.224	7.5295	287.3687	0.13541	1.1899	29.121	1.79E-05
0.249	7.64744	287.3759	0.13968	1.1899	29.121	1.79E-05

0.2735	7.74581	287.3843	0.14329	1.1899	29.121	1.79E-05
0.299	7.84027	287.3875	0.14681	1.1898	29.121	1.79E-05
0.3235	7.86071	287.371	0.14758	1.1899	29.121	1.79E-05
0.3485	7.97022	287.3695	0.15172	1.1899	29.121	1.79E-05
0.373	8.03996	287.3644	0.15439	1.1899	29.121	1.79E-05
0.3985	8.09878	287.3513	0.15667	1.19	29.121	1.79E-05
0.4225	8.18832	287.3488	0.16015	1.19	29.121	1.79E-05
0.448	8.25041	287.3222	0.16261	1.1901	29.121	1.79E-05
0.4725	8.29674	287.3539	0.16442	1.19	29.121	1.79E-05
0.4985	8.40821	287.3464	0.16887	1.19	29.121	1.79E-05
0.5225	8.47034	287.3183	0.1714	1.1902	29.121	1.79E-05
0.5475	8.50682	287.3482	0.17286	1.19	29.121	1.79E-05
0.572	8.59599	287.3251	0.17651	1.1901	29.121	1.79E-05
0.598	8.64044	287.3433	0.17833	1.19	29.121	1.79E-05
0.6475	8.72729	287.3119	0.18196	1.1902	29.121	1.79E-05
0.6975	8.89461	287.3332	0.18899	1.1901	29.121	1.79E-05
0.747	8.98207	287.3361	0.19272	1.1901	29.121	1.79E-05
0.797	9.07907	287.3597	0.19689	1.19	29.121	1.79E-05
0.8465	9.16595	287.3501	0.20068	1.19	29.121	1.79E-05
0.8965	9.26948	287.3593	0.20523	1.19	29.121	1.79E-05
0.946	9.34571	287.341	0.20863	1.19	29.121	1.79E-05
0.996	9.44574	287.33	0.21313	1.1901	29.121	1.79E-05
1.0455	9.51248	287.3257	0.21616	1.1901	29.121	1.79E-05
1.0955	9.61648	287.3212	0.22092	1.1901	29.121	1.79E-05
1.145	9.67977	287.329	0.22383	1.1901	29.121	1.79E-05
1.195	9.76823	287.3369	0.22793	1.1901	29.121	1.79E-05
1.2695	9.8789	287.3267	0.23313	1.1901	29.121	1.79E-05
1.344	9.95382	287.3128	0.23669	1.1902	29.121	1.79E-05
1.419	10.04803	287.315	0.24119	1.1902	29.121	1.79E-05
1.493	10.09429	287.316	0.24342	1.1902	29.121	1.79E-05
1.5685	10.16891	287.3023	0.24704	1.1902	29.121	1.79E-05
1.6425	10.21041	287.2837	0.24908	1.1903	29.121	1.79E-05
1.718	10.24595	287.2798	0.25082	1.1903	29.121	1.79E-05
1.7915	10.274	287.2884	0.25219	1.1903	29.121	1.79E-05
1.867	10.27757	287.2687	0.25238	1.1904	29.121	1.79E-05
1.9415	10.28016	287.2687	0.25251	1.1904	29.121	1.79E-05
2.017	10.2956	287.2531	0.25328	1.1904	29.121	1.79E-05
2.0915	10.30128	287.2716	0.25355	1.1904	29.121	1.79E-05
2.167	10.31016	287.2581	0.254	1.1904	29.121	1.79E-05
2.2415	10.3171	287.2558	0.25434	1.1904	29.121	1.79E-05
2.3175	10.3389	287.2271	0.25545	1.1906	29.121	1.79E-05
2.3915	10.31612	287.2378	0.25431	1.1905	29.121	1.79E-05
2.467	10.32143	287.2427	0.25457	1.1905	29.121	1.79E-05
2.5415	10.32654	287.2243	0.25484	1.1906	29.121	1.79E-05
2.617	10.31804	287.2243	0.25442	1.1906	29.121	1.79E-05
2.6915	10.3308	287.2359	0.25504	1.1905	29.121	1.79E-05
2.7665	10.34033	287.2357	0.25551	1.1905	29.121	1.79E-05
2.8415	10.33137	287.2439	0.25506	1.1905	29.121	1.79E-05
2.917	10.31239	287.221	0.25414	1.1906	29.121	1.79E-05
2.991	10.33598	287.229	0.2553	1.1906	29.121	1.79E-05
3.091	10.35441	287.2351	0.2562	1.1905	29.121	1.79E-05
3.191	10.34811	287.2118	0.25592	1.1906	29.121	1.79E-05
3.291	10.33884	287.2148	0.25545	1.1906	29.121	1.79E-05
3.391	10.35428	287.2349	0.2562	1.1905	29.121	1.79E-05
3.491	10.34598	287.2126	0.25581	1.1906	29.121	1.79E-05
3.591	10.34921	287.2206	0.25596	1.1906	29.121	1.79E-05
3.691	10.34866	287.2241	0.25593	1.1906	29.121	1.79E-05
3.791	10.35312	287.2298	0.25615	1.1906	29.121	1.79E-05

10/4/00	10:03 AM	2				
Rel Humidi	77					
y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.001	3.04348	288.3051	0.02205	1.1857	29.121	1.80E-05
0.002	3.11269	288.3124	0.02306	1.1857	29.121	1.80E-05
0.003	3.19847	288.3229	0.02435	1.1856	29.121	1.80E-05
0.004	3.25858	288.3001	0.02527	1.1857	29.121	1.80E-05
0.005	3.40767	288.295	0.02764	1.1857	29.121	1.80E-05
0.006	3.43705	288.3061	0.02812	1.1857	29.121	1.80E-05
0.0065	3.56032	288.3159	0.03017	1.1856	29.121	1.80E-05
0.008	3.63746	288.3319	0.03149	1.1856	29.121	1.80E-05
0.009	3.69597	288.3274	0.03251	1.1856	29.121	1.80E-05
0.01	3.78589	288.3385	0.03411	1.1855	29.121	1.80E-05
0.0115	3.90368	288.3559	0.03626	1.1855	29.121	1.80E-05
0.0125	3.97918	288.3492	0.03768	1.1855	29.121	1.80E-05
0.0135	4.02931	288.3348	0.03864	1.1856	29.121	1.80E-05
0.0145	4.03193	288.3674	0.03868	1.1854	29.121	1.80E-05
0.015	4.10076	288.3319	0.04002	1.1856	29.121	1.80E-05
0.016	4.16717	288.3553	0.04132	1.1855	29.121	1.80E-05
0.018	4.28261	288.3397	0.04364	1.1855	29.121	1.80E-05
0.02	4.38425	288.3327	0.04574	1.1856	29.121	1.80E-05
0.0225	4.49614	288.3403	0.04811	1.1855	29.121	1.80E-05
0.024	4.59039	288.3586	0.05014	1.1855	29.121	1.80E-05
0.026	4.64449	288.3508	0.05133	1.1855	29.121	1.80E-05
0.028	4.68018	288.3596	0.05212	1.1855	29.121	1.80E-05
0.0305	4.78273	288.3606	0.05443	1.1854	29.121	1.80E-05
0.0325	4.87966	288.3645	0.05666	1.1854	29.121	1.80E-05
0.0345	4.91095	288.3656	0.05739	1.1854	29.121	1.80E-05
0.036	4.95075	288.3715	0.05832	1.1854	29.121	1.80E-05
0.038	4.96848	288.3625	0.05874	1.1854	29.121	1.80E-05
0.04	5.02305	288.3707	0.06003	1.1854	29.121	1.80E-05
0.0425	5.08477	288.3449	0.06152	1.1855	29.121	1.80E-05
0.044	5.1778	288.3686	0.06379	1.1854	29.121	1.80E-05
0.046	5.20861	288.3971	0.06454	1.1853	29.121	1.80E-05
0.048	5.1694	288.3953	0.06358	1.1853	29.121	1.80E-05
0.0505	5.2351	288.3867	0.06521	1.1853	29.121	1.80E-05
0.055	5.35818	288.3855	0.06831	1.1853	29.121	1.80E-05
0.06	5.41866	288.3672	0.06986	1.1854	29.121	1.80E-05
0.065	5.44056	288.3719	0.07043	1.1854	29.121	1.80E-05
0.0705	5.5052	288.3611	0.07211	1.1854	29.121	1.80E-05
0.075	5.55581	288.3649	0.07345	1.1854	29.121	1.80E-05
0.08	5.60767	288.3816	0.07482	1.1854	29.121	1.80E-05
0.085	5.66093	288.4148	0.07624	1.1852	29.121	1.80E-05
0.0905	5.65642	288.393	0.07612	1.1853	29.121	1.80E-05
0.095	5.72093	288.4051	0.07786	1.1852	29.121	1.80E-05
0.1	5.73008	288.4179	0.07811	1.1852	29.121	1.80E-05
0.1105	5.78346	288.4041	0.07958	1.1853	29.121	1.80E-05
0.12	5.85537	288.4216	0.08156	1.1852	29.121	1.80E-05
0.1305	5.86962	288.415	0.08196	1.1852	29.121	1.80E-05
0.14	5.89095	288.3949	0.08256	1.1853	29.121	1.80E-05
0.1505	5.95148	288.4275	0.08426	1.1851	29.121	1.80E-05
0.16	5.96699	288.4294	0.0847	1.1851	29.121	1.80E-05
0.1705	6.08494	288.4486	0.08807	1.1851	29.121	1.80E-05
0.18	6.08215	288.4246	0.088	1.1852	29.121	1.80E-05
0.1905	6.12278	288.4279	0.08918	1.1851	29.121	1.80E-05
0.2	6.16285	288.4437	0.09035	1.1851	29.121	1.80E-05
0.225	6.28967	288.4449	0.0941	1.1851	29.121	1.80E-05
0.2505	6.41786	288.4665	0.09797	1.185	29.121	1.80E-05

0.275	6.48076	288.4562	0.0999	1.185	29.121	1.80E-05
0.3	6.61378	288.4609	0.10404	1.185	29.121	1.80E-05
0.325	6.8042	288.4534	0.11012	1.185	29.121	1.80E-05
0.3505	6.89367	288.4343	0.11305	1.1851	29.121	1.80E-05
0.375	7.03145	288.3652	0.11764	1.1854	29.121	1.80E-05
0.3995	7.10474	288.3342	0.12012	1.1856	29.121	1.80E-05
0.4245	7.21683	288.3155	0.12395	1.1857	29.121	1.80E-05
0.45	7.25535	288.2858	0.12529	1.1858	29.121	1.80E-05
0.475	7.43871	288.2511	0.13172	1.1859	29.121	1.80E-05
0.4995	7.50157	288.2366	0.13396	1.186	29.121	1.80E-05
0.5245	7.67622	288.2321	0.14028	1.186	29.121	1.80E-05
0.5495	7.70523	288.2298	0.14134	1.186	29.121	1.80E-05
0.5745	7.83645	288.2368	0.14619	1.186	29.121	1.80E-05
0.5995	7.8785	288.2296	0.14777	1.186	29.121	1.80E-05
0.6495	8.04427	288.2308	0.15405	1.186	29.121	1.80E-05
0.699	8.22136	288.2013	0.16093	1.1862	29.121	1.80E-05
0.749	8.39278	288.2036	0.16771	1.1862	29.121	1.80E-05
0.799	8.60434	288.1917	0.17628	1.1862	29.121	1.80E-05
0.849	8.70932	288.1822	0.18061	1.1863	29.121	1.80E-05
0.8985	8.87616	288.1752	0.1876	1.1863	29.121	1.80E-05
0.9485	8.97344	288.1771	0.19173	1.1863	29.121	1.80E-05
0.9985	9.10042	288.1691	0.1972	1.1863	29.121	1.80E-05
1.0485	9.20853	288.1492	0.20193	1.1864	29.121	1.80E-05
1.098	9.38703	288.1623	0.20983	1.1863	29.121	1.80E-05
1.148	9.46108	288.1437	0.21317	1.1864	29.121	1.80E-05
1.1975	9.61428	288.1556	0.22012	1.1864	29.121	1.80E-05
1.2735	9.71304	288.1506	0.22467	1.1864	29.121	1.80E-05
1.3475	9.89061	288.149	0.23296	1.1864	29.121	1.80E-05
1.4225	10.01836	288.1299	0.23903	1.1865	29.121	1.80E-05
1.497	10.14171	288.1207	0.24496	1.1865	29.121	1.80E-05
1.5725	10.28696	288.1242	0.25202	1.1865	29.121	1.80E-05
1.6465	10.37596	288.1203	0.25641	1.1865	29.121	1.80E-05
1.7215	10.47038	288.1219	0.26109	1.1865	29.121	1.80E-05
1.796	10.54299	288.1125	0.26474	1.1866	29.121	1.79E-05
1.8715	10.6206	288.1279	0.26863	1.1865	29.121	1.80E-05
1.946	10.69758	288.1059	0.27256	1.1866	29.121	1.79E-05
2.0205	10.73455	288.125	0.27443	1.1865	29.121	1.80E-05
2.0955	10.7822	288.1223	0.27688	1.1865	29.121	1.80E-05
2.1705	10.8336	288.1043	0.27954	1.1866	29.121	1.79E-05
2.245	10.85652	288.0834	0.28075	1.1867	29.121	1.79E-05
2.3195	10.87089	288.1051	0.28147	1.1866	29.121	1.79E-05
2.395	10.89031	288.0975	0.28248	1.1866	29.121	1.79E-05
2.4695	10.90886	288.1014	0.28344	1.1866	29.121	1.79E-05
2.5445	10.92023	288.1096	0.28403	1.1866	29.121	1.79E-05
2.6185	10.92036	288.099	0.28404	1.1866	29.121	1.79E-05
2.6945	10.92094	288.0973	0.28408	1.1866	29.121	1.79E-05
2.7685	10.93182	288.0713	0.28467	1.1868	29.121	1.79E-05
2.844	10.95499	288.0764	0.28587	1.1867	29.121	1.79E-05
2.918	10.96493	288.0469	0.28642	1.1869	29.121	1.79E-05
2.9935	10.97272	288.0682	0.28681	1.1868	29.121	1.79E-05
3.0935	10.99483	288.0738	0.28796	1.1867	29.121	1.79E-05
3.193	10.99021	288.0692	0.28772	1.1868	29.121	1.79E-05
3.293	10.9773	288.0674	0.28705	1.1868	29.121	1.79E-05
3.393	10.98669	288.0801	0.28752	1.1867	29.121	1.79E-05
3.4925	10.99715	288.0781	0.28807	1.1867	29.121	1.79E-05
3.592	10.99654	288.0953	0.28802	1.1866	29.121	1.79E-05
3.692	11.00664	288.0887	0.28856	1.1867	29.121	1.79E-05
3.792	11.00087	288.085	0.28826	1.1867	29.121	1.79E-05

10/4/00 12:12 PM LEC
 Rel Humidi 77

y (cm)	Vmean (m	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.001	3.37807	287.9946	0.02719	1.1871	29.121	1.79E-05
0.002	3.4124	287.9926	0.02775	1.1871	29.121	1.79E-05
0.003	3.47301	287.9784	0.02874	1.1872	29.121	1.79E-05
0.004	3.54804	287.9628	0.03	1.1872	29.121	1.79E-05
0.005	3.58267	287.9712	0.03059	1.1872	29.121	1.79E-05
0.006	3.72351	287.9639	0.03304	1.1872	29.121	1.79E-05
0.0065	3.78668	287.9512	0.03417	1.1873	29.121	1.79E-05
0.0075	3.84462	287.9548	0.03523	1.1873	29.121	1.79E-05
0.009	4.00102	287.9647	0.03815	1.1872	29.121	1.79E-05
0.01	4.06678	287.9462	0.03942	1.1873	29.121	1.79E-05
0.0115	4.15749	287.946	0.04119	1.1873	29.121	1.79E-05
0.0125	4.26201	287.9413	0.04329	1.1873	29.121	1.79E-05
0.0135	4.37171	287.9202	0.04555	1.1874	29.121	1.79E-05
0.0145	4.43964	287.9454	0.04697	1.1873	29.121	1.79E-05
0.015	4.51955	287.9171	0.04869	1.1874	29.121	1.79E-05
0.016	4.61998	287.9323	0.05087	1.1874	29.121	1.79E-05
0.0175	4.79996	287.9233	0.05491	1.1874	29.121	1.79E-05
0.02	4.96883	287.9181	0.05885	1.1874	29.121	1.79E-05
0.022	5.14239	287.9136	0.06303	1.1875	29.121	1.79E-05
0.024	5.31496	287.9198	0.06733	1.1874	29.121	1.79E-05
0.026	5.43349	287.8972	0.07037	1.1875	29.121	1.79E-05
0.028	5.54852	287.9077	0.07338	1.1875	29.121	1.79E-05
0.03	5.66232	287.9097	0.07642	1.1875	29.121	1.79E-05
0.0325	5.78398	287.8931	0.07975	1.1876	29.121	1.79E-05
0.0345	5.89586	287.8784	0.08286	1.1876	29.121	1.79E-05
0.036	5.95251	287.8521	0.08447	1.1877	29.121	1.79E-05
0.038	6.06352	287.8677	0.08765	1.1877	29.121	1.79E-05
0.04	6.13406	287.8724	0.0897	1.1876	29.121	1.79E-05
0.042	6.16148	287.8599	0.09051	1.1877	29.121	1.79E-05
0.044	6.24646	287.8439	0.09302	1.1878	29.121	1.79E-05
0.046	6.31971	287.8585	0.09521	1.1877	29.121	1.79E-05
0.048	6.3372	287.8603	0.09574	1.1877	29.121	1.79E-05
0.05	6.39279	287.8489	0.09743	1.1878	29.121	1.79E-05
0.055	6.50662	287.8505	0.10093	1.1877	29.121	1.79E-05
0.06	6.65184	287.8404	0.10549	1.1878	29.121	1.79E-05
0.065	6.6731	287.8489	0.10616	1.1878	29.121	1.79E-05
0.07	6.75247	287.831	0.10871	1.1878	29.121	1.79E-05
0.075	6.84966	287.8491	0.11186	1.1878	29.121	1.79E-05
0.08	6.91033	287.8427	0.11385	1.1878	29.121	1.79E-05
0.085	6.91048	287.8591	0.11385	1.1877	29.121	1.79E-05
0.09	6.96029	287.8318	0.11551	1.1878	29.121	1.79E-05
0.095	7.08606	287.8532	0.11971	1.1877	29.121	1.79E-05
0.1	7.14129	287.8657	0.12158	1.1877	29.121	1.79E-05
0.11	7.12879	287.8478	0.12116	1.1878	29.121	1.79E-05
0.12	7.23107	287.8359	0.12467	1.1878	29.121	1.79E-05
0.13	7.27662	287.8343	0.12624	1.1878	29.121	1.79E-05
0.14	7.34991	287.8226	0.1288	1.1879	29.121	1.79E-05
0.15	7.44989	287.8116	0.13234	1.1879	29.121	1.79E-05
0.1595	7.47423	287.8454	0.13319	1.1878	29.121	1.79E-05
0.17	7.56707	287.8349	0.13652	1.1878	29.121	1.79E-05
0.1795	7.59087	287.8267	0.13739	1.1879	29.121	1.79E-05
0.19	7.63028	287.8366	0.13881	1.1878	29.121	1.79E-05
0.1995	7.65407	287.8304	0.13968	1.1878	29.121	1.79E-05
0.225	7.76551	287.828	0.14378	1.1878	29.121	1.79E-05
0.25	7.92775	287.822	0.14985	1.1879	29.121	1.79E-05

0.275	7.98442	287.8243	0.152	1.1879	29.121	1.79E-05
0.2995	8.05767	287.8189	0.15481	1.1879	29.121	1.79E-05
0.3245	8.16922	287.8142	0.15913	1.1879	29.121	1.79E-05
0.3495	8.22569	287.7999	0.16134	1.188	29.121	1.79E-05
0.3745	8.34359	287.7931	0.16601	1.188	29.121	1.79E-05
0.399	8.42064	287.8111	0.16907	1.1879	29.121	1.79E-05
0.4245	8.45262	287.8476	0.17034	1.1878	29.121	1.79E-05
0.449	8.55754	287.813	0.17461	1.1879	29.121	1.79E-05
0.4745	8.606	287.8197	0.17659	1.1879	29.121	1.79E-05
0.4985	8.68116	287.823	0.17969	1.1879	29.121	1.79E-05
0.524	8.75281	287.8072	0.18268	1.1879	29.121	1.79E-05
0.549	8.82302	287.7917	0.18563	1.188	29.121	1.79E-05
0.574	8.88488	287.8165	0.18823	1.1879	29.121	1.79E-05
0.5985	8.91658	287.8044	0.18958	1.188	29.121	1.79E-05
0.6485	9.04364	287.8239	0.19501	1.1879	29.121	1.79E-05
0.698	9.13312	287.8454	0.19887	1.1878	29.121	1.79E-05
0.748	9.23503	287.8913	0.2033	1.1876	29.121	1.79E-05
0.798	9.38515	287.9106	0.20994	1.1875	29.121	1.79E-05
0.848	9.47348	287.9485	0.21388	1.1873	29.121	1.79E-05
0.8975	9.58179	288.0174	0.21874	1.187	29.121	1.79E-05
0.9475	9.65677	288.0077	0.22219	1.187	29.121	1.79E-05
0.9975	9.71973	288.061	0.22505	1.1868	29.121	1.79E-05
1.047	9.83144	288.0319	0.23028	1.1869	29.121	1.79E-05
1.097	9.90545	288.0641	0.23373	1.1868	29.121	1.79E-05
1.147	9.98896	288.0356	0.23771	1.1869	29.121	1.79E-05
1.1965	10.08014	288.06	0.24205	1.1868	29.121	1.79E-05
1.272	10.16965	288.0707	0.24636	1.1868	29.121	1.79E-05
1.3465	10.23815	288.077	0.24968	1.1867	29.121	1.79E-05
1.421	10.35918	288.0686	0.25563	1.1868	29.121	1.79E-05
1.496	10.40935	288.0639	0.25812	1.1868	29.121	1.79E-05
1.571	10.48953	288.0699	0.2621	1.1868	29.121	1.79E-05
1.6455	10.54381	288.0332	0.26486	1.1869	29.121	1.79E-05
1.72	10.58789	288.0303	0.26708	1.1869	29.121	1.79E-05
1.795	10.62047	288.0381	0.26872	1.1869	29.121	1.79E-05
1.8695	10.65349	288.0303	0.2704	1.1869	29.121	1.79E-05
1.9445	10.6861	288.0198	0.27207	1.187	29.121	1.79E-05
2.019	10.70557	288.0096	0.27307	1.187	29.121	1.79E-05
2.0945	10.71148	288.0557	0.27333	1.1868	29.121	1.79E-05
2.1685	10.74347	288.0368	0.27498	1.1869	29.121	1.79E-05
2.244	10.76369	288.0455	0.27601	1.1869	29.121	1.79E-05
2.318	10.74204	288.0403	0.2749	1.1869	29.121	1.79E-05
2.394	10.7795	288.0229	0.27684	1.187	29.121	1.79E-05
2.468	10.76412	288.027	0.27605	1.187	29.121	1.79E-05
2.543	10.76112	288.0227	0.2759	1.187	29.121	1.79E-05
2.6175	10.76324	287.9772	0.27606	1.1872	29.121	1.79E-05
2.693	10.76281	288.0235	0.27599	1.187	29.121	1.79E-05
2.767	10.75869	288.0166	0.27578	1.187	29.121	1.79E-05
2.842	10.75514	288.036	0.27558	1.1869	29.121	1.79E-05
2.9165	10.74395	288.0233	0.27502	1.187	29.121	1.79E-05
2.992	10.74855	287.9922	0.27529	1.1871	29.121	1.79E-05
3.0915	10.73762	288.0231	0.2747	1.187	29.121	1.79E-05
3.1915	10.7486	288.06	0.27522	1.1868	29.121	1.79E-05
3.291	10.73754	288.0391	0.27467	1.1869	29.121	1.79E-05
3.3905	10.74088	288.061	0.27482	1.1868	29.121	1.79E-05
3.49	10.73321	288.06	0.27443	1.1868	29.121	1.79E-05
3.59	10.7222	288.0483	0.27388	1.1869	29.121	1.79E-05
3.69	10.72914	288.0473	0.27424	1.1869	29.121	1.79E-05
3.79	10.73982	288.035	0.2748	1.1869	29.121	1.79E-05

10/4/00 10:36 AM		TEC				
Rel Humidi 77						
y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.001	2.81083	288.7172	0.01877	1.1838	29.121	1.80E-05
0.0025	2.90167	288.6675	0.02001	1.1841	29.121	1.80E-05
0.003	2.91629	288.6554	0.02021	1.1841	29.121	1.80E-05
0.004	2.95303	288.6685	0.02073	1.1841	29.121	1.80E-05
0.005	2.99554	288.6755	0.02133	1.184	29.121	1.80E-05
0.0055	2.96354	288.6649	0.02087	1.1841	29.121	1.80E-05
0.0065	2.99562	288.6603	0.02133	1.1841	29.121	1.80E-05
0.0075	3.04419	288.64	0.02203	1.1842	29.121	1.80E-05
0.0085	3.02256	288.6421	0.02172	1.1842	29.121	1.80E-05
0.0095	3.07247	288.6538	0.02244	1.1841	29.121	1.80E-05
0.011	3.20693	288.6382	0.02445	1.1842	29.121	1.80E-05
0.012	3.28039	288.6532	0.02558	1.1841	29.121	1.80E-05
0.013	3.32358	288.6482	0.02626	1.1842	29.121	1.80E-05
0.0135	3.36831	288.6519	0.02697	1.1841	29.121	1.80E-05
0.0145	3.43961	288.6515	0.02812	1.1841	29.121	1.80E-05
0.0155	3.54028	288.6454	0.02979	1.1842	29.121	1.80E-05
0.0175	3.59303	288.6468	0.03069	1.1842	29.121	1.80E-05
0.02	3.66136	288.6433	0.03186	1.1842	29.121	1.80E-05
0.0225	3.76715	288.6568	0.03373	1.1841	29.121	1.80E-05
0.024	3.80923	288.6441	0.03449	1.1842	29.121	1.80E-05
0.0255	3.88801	288.6644	0.03593	1.1841	29.121	1.80E-05
0.0275	3.96511	288.6324	0.03737	1.1842	29.121	1.80E-05
0.0295	3.95273	288.6374	0.03714	1.1842	29.121	1.80E-05
0.032	3.98921	288.6131	0.03783	1.1843	29.121	1.80E-05
0.034	3.99262	288.5537	0.0379	1.1846	29.121	1.80E-05
0.0355	4.14271	288.5292	0.04081	1.1847	29.121	1.80E-05
0.0375	4.10987	288.4944	0.04017	1.1848	29.121	1.80E-05
0.04	4.22803	288.4589	0.04252	1.185	29.121	1.80E-05
0.0425	4.21955	288.4482	0.04235	1.1851	29.121	1.80E-05
0.044	4.25726	288.4125	0.04312	1.1852	29.121	1.80E-05
0.0455	4.24692	288.3998	0.04291	1.1853	29.121	1.80E-05
0.0475	4.278	288.3896	0.04354	1.1853	29.121	1.80E-05
0.05	4.29386	288.4037	0.04386	1.1853	29.121	1.80E-05
0.0545	4.44815	288.3906	0.04707	1.1853	29.121	1.80E-05
0.06	4.50451	288.3908	0.04828	1.1853	29.121	1.80E-05
0.065	4.48825	288.3758	0.04793	1.1854	29.121	1.80E-05
0.07	4.641	288.3779	0.05125	1.1854	29.121	1.80E-05
0.0745	4.65401	288.3545	0.05154	1.1855	29.121	1.80E-05
0.08	4.71527	288.3719	0.0529	1.1854	29.121	1.80E-05
0.085	4.83005	288.3764	0.05551	1.1854	29.121	1.80E-05
0.0895	4.85438	288.3691	0.05607	1.1854	29.121	1.80E-05
0.0945	4.93327	288.35	0.05791	1.1855	29.121	1.80E-05
0.1	4.9705	288.3469	0.05879	1.1855	29.121	1.80E-05
0.1095	5.08737	288.3323	0.06159	1.1856	29.121	1.80E-05
0.12	5.14484	288.3514	0.06298	1.1855	29.121	1.80E-05
0.1295	5.25862	288.3477	0.0658	1.1855	29.121	1.80E-05
0.14	5.33344	288.3352	0.06769	1.1856	29.121	1.80E-05
0.15	5.45115	288.3397	0.07071	1.1855	29.121	1.80E-05
0.16	5.51329	288.3278	0.07234	1.1856	29.121	1.80E-05
0.1695	5.62514	288.3151	0.0753	1.1857	29.121	1.80E-05
0.18	5.71564	288.3153	0.07775	1.1857	29.121	1.80E-05
0.1895	5.8331	288.2958	0.08098	1.1857	29.121	1.80E-05
0.2	5.87565	288.3083	0.08216	1.1857	29.121	1.80E-05
0.2245	6.10128	288.2823	0.0886	1.1858	29.121	1.80E-05
0.2495	6.23356	288.309	0.09248	1.1857	29.121	1.80E-05

0.2745	6.40725	288.2872	0.09771	1.1858	29.121	1.80E-05
0.3	6.51093	288.2905	0.1009	1.1858	29.121	1.80E-05
0.3245	6.62099	288.2657	0.10435	1.1859	29.121	1.80E-05
0.3495	6.76833	288.2804	0.10904	1.1858	29.121	1.80E-05
0.3745	6.85857	288.2665	0.11197	1.1859	29.121	1.80E-05
0.4	7.00347	288.2766	0.11675	1.1858	29.121	1.80E-05
0.4245	7.04924	288.2878	0.11827	1.1858	29.121	1.80E-05
0.4495	7.1084	288.2663	0.12028	1.1859	29.121	1.80E-05
0.4745	7.19018	288.2854	0.12305	1.1858	29.121	1.80E-05
0.5	7.28882	288.2784	0.12645	1.1858	29.121	1.80E-05
0.5245	7.35619	288.2788	0.1288	1.1858	29.121	1.80E-05
0.5495	7.45879	288.2665	0.13243	1.1859	29.121	1.80E-05
0.5745	7.52274	288.2811	0.1347	1.1858	29.121	1.80E-05
0.6	7.59143	288.2692	0.13718	1.1859	29.121	1.80E-05
0.6495	7.74767	288.2723	0.14288	1.1858	29.121	1.80E-05
0.6995	7.91922	288.2636	0.14928	1.1859	29.121	1.80E-05
0.7495	8.12018	288.2723	0.15695	1.1858	29.121	1.80E-05
0.7995	8.28496	288.2597	0.16339	1.1859	29.121	1.80E-05
0.849	8.54869	288.2643	0.17395	1.1859	29.121	1.80E-05
0.899	8.65269	288.2548	0.17822	1.1859	29.121	1.80E-05
0.9485	8.83397	288.2737	0.18575	1.1858	29.121	1.80E-05
0.999	8.92811	288.254	0.18975	1.1859	29.121	1.80E-05
1.0485	9.09198	288.2595	0.19677	1.1859	29.121	1.80E-05
1.0985	9.25434	288.247	0.20387	1.186	29.121	1.80E-05
1.148	9.39422	288.2622	0.21007	1.1859	29.121	1.80E-05
1.198	9.50849	288.2567	0.21522	1.1859	29.121	1.80E-05
1.273	9.71033	288.2591	0.22445	1.1859	29.121	1.80E-05
1.3475	9.87308	288.2602	0.23203	1.1859	29.121	1.80E-05
1.423	9.97925	288.2569	0.23705	1.1859	29.121	1.80E-05
1.4975	10.11164	288.2528	0.24339	1.1859	29.121	1.80E-05
1.5725	10.19457	288.2622	0.24739	1.1859	29.121	1.80E-05
1.647	10.27304	288.2565	0.25122	1.1859	29.121	1.80E-05
1.7225	10.42108	288.2517	0.25851	1.1859	29.121	1.80E-05
1.7965	10.48369	288.2466	0.26163	1.186	29.121	1.80E-05
1.872	10.52499	288.2374	0.26371	1.186	29.121	1.80E-05
1.9465	10.6202	288.2485	0.26849	1.186	29.121	1.80E-05
2.022	10.65696	288.2491	0.27035	1.1859	29.121	1.80E-05
2.096	10.73001	288.2366	0.27408	1.186	29.121	1.80E-05
2.1715	10.7445	288.2357	0.27483	1.186	29.121	1.80E-05
2.246	10.7621	288.2251	0.27574	1.1861	29.121	1.80E-05
2.3215	10.78756	288.2362	0.27703	1.186	29.121	1.80E-05
2.3955	10.81826	288.2193	0.27863	1.1861	29.121	1.80E-05
2.471	10.83403	288.23	0.27943	1.186	29.121	1.80E-05
2.5455	10.86353	288.2175	0.28097	1.1861	29.121	1.80E-05
2.621	10.87256	288.2109	0.28144	1.1861	29.121	1.80E-05
2.695	10.8799	288.199	0.28184	1.1862	29.121	1.80E-05
2.77	10.8654	288.2323	0.28105	1.186	29.121	1.80E-05
2.845	10.89029	288.1923	0.28238	1.1862	29.121	1.80E-05
2.92	10.89676	288.2208	0.28269	1.1861	29.121	1.80E-05
2.9945	10.901	288.2079	0.28292	1.1861	29.121	1.80E-05
3.0945	10.92132	288.2113	0.28397	1.1861	29.121	1.80E-05
3.194	10.91229	288.2245	0.28349	1.1861	29.121	1.80E-05
3.2935	10.91044	288.2355	0.28338	1.186	29.121	1.80E-05
3.3935	10.90377	288.2239	0.28305	1.1861	29.121	1.80E-05
3.493	10.87534	288.2236	0.28157	1.1861	29.121	1.80E-05
3.593	10.91391	288.2456	0.28355	1.186	29.121	1.80E-05
3.6925	10.8941	288.2608	0.2825	1.1859	29.121	1.80E-05
3.7925	10.9064	288.2823	0.28312	1.1858	29.121	1.80E-05

10/4/00 11:35 AM 7
 Rel Humidi 77
 y (cm) Vmean (m/ T (degK) DP ("H2O) density (kg Patm ("Hg) viscosity (kg/ms)

0.001	4.34848	288.5005	0.04497	1.1848	29.121	1.80E-05
0.002	4.38044	288.48	0.04564	1.1849	29.121	1.80E-05
0.0035	4.50364	288.496	0.04824	1.1848	29.121	1.80E-05
0.004	4.5641	288.4726	0.04955	1.1849	29.121	1.80E-05
0.005	4.64427	288.4763	0.0513	1.1849	29.121	1.80E-05
0.006	4.78889	288.4874	0.05454	1.1849	29.121	1.80E-05
0.007	4.8281	288.4774	0.05544	1.1849	29.121	1.80E-05
0.008	4.93374	288.4759	0.05789	1.1849	29.121	1.80E-05
0.009	4.99673	288.4812	0.05938	1.1849	29.121	1.80E-05
0.01	5.10769	288.4821	0.06205	1.1849	29.121	1.80E-05
0.0115	5.1855	288.5036	0.06395	1.1848	29.121	1.80E-05
0.0125	5.26422	288.4808	0.06591	1.1849	29.121	1.80E-05
0.0135	5.27758	288.4722	0.06625	1.1849	29.121	1.80E-05
0.0145	5.45811	288.4933	0.07085	1.1848	29.121	1.80E-05
0.015	5.47072	288.4792	0.07118	1.1849	29.121	1.80E-05
0.016	5.57395	288.4718	0.0739	1.1849	29.121	1.80E-05
0.018	5.65349	288.4972	0.07601	1.1848	29.121	1.80E-05
0.02	5.81117	288.4542	0.08033	1.185	29.121	1.80E-05
0.0225	5.90972	288.4423	0.08308	1.1851	29.121	1.80E-05
0.024	6.01214	288.3976	0.086	1.1853	29.121	1.80E-05
0.026	6.12557	288.3506	0.08929	1.1855	29.121	1.80E-05
0.028	6.19761	288.2971	0.09142	1.1857	29.121	1.80E-05
0.03	6.28175	288.2681	0.09393	1.1859	29.121	1.80E-05
0.0325	6.3664	288.2763	0.09647	1.1858	29.121	1.80E-05
0.0345	6.40844	288.2495	0.09776	1.1859	29.121	1.80E-05
0.036	6.42065	288.2236	0.09814	1.1861	29.121	1.80E-05
0.038	6.52068	288.2197	0.10123	1.1861	29.121	1.80E-05
0.04	6.59249	288.1933	0.10348	1.1862	29.121	1.80E-05
0.0425	6.60609	288.2011	0.1039	1.1862	29.121	1.80E-05
0.0445	6.6484	288.1943	0.10524	1.1862	29.121	1.80E-05
0.046	6.72627	288.221	0.10771	1.1861	29.121	1.80E-05
0.048	6.72201	288.2206	0.10757	1.1861	29.121	1.80E-05
0.0505	6.757	288.1992	0.10871	1.1862	29.121	1.80E-05
0.0555	6.88316	288.2001	0.1128	1.1862	29.121	1.80E-05
0.06	6.97573	288.1699	0.11587	1.1863	29.121	1.80E-05
0.065	7.04986	288.1857	0.11834	1.1862	29.121	1.80E-05
0.0705	7.074	288.1822	0.11915	1.1863	29.121	1.80E-05
0.0755	7.13796	288.1568	0.12133	1.1864	29.121	1.80E-05
0.08	7.19024	288.1652	0.12311	1.1863	29.121	1.80E-05
0.085	7.24291	288.1619	0.12492	1.1863	29.121	1.80E-05
0.0905	7.29	288.1709	0.12655	1.1863	29.121	1.80E-05
0.0955	7.33714	288.1874	0.12818	1.1862	29.121	1.80E-05
0.1	7.41673	288.1494	0.13099	1.1864	29.121	1.80E-05
0.11	7.44656	288.1468	0.13205	1.1864	29.121	1.80E-05
0.12	7.58426	288.1521	0.13698	1.1864	29.121	1.80E-05
0.13	7.62676	288.1219	0.13853	1.1865	29.121	1.80E-05
0.14	7.66768	288.1351	0.14002	1.1865	29.121	1.80E-05
0.1505	7.74942	288.1519	0.14301	1.1864	29.121	1.80E-05
0.16	7.83527	288.1609	0.14619	1.1863	29.121	1.80E-05
0.1705	7.83436	288.1324	0.14617	1.1865	29.121	1.80E-05
0.18	7.89239	288.1383	0.14834	1.1864	29.121	1.80E-05
0.19	7.94488	288.1326	0.15032	1.1865	29.121	1.80E-05
0.2	7.95644	288.1316	0.15076	1.1865	29.121	1.80E-05
0.225	8.07377	288.1293	0.15524	1.1865	29.121	1.80E-05
0.25	8.16795	288.117	0.15889	1.1865	29.121	1.79E-05

0.275	8.22205	288.1103	0.16101	1.1866	29.121	1.79E-05
0.2995	8.34734	288.1303	0.16594	1.1865	29.121	1.80E-05
0.3245	8.45534	288.1232	0.17027	1.1865	29.121	1.80E-05
0.3495	8.52154	288.1217	0.17295	1.1865	29.121	1.80E-05
0.3745	8.6218	288.1375	0.17703	1.1865	29.121	1.80E-05
0.399	8.66087	288.1158	0.17865	1.1866	29.121	1.79E-05
0.424	8.72896	288.107	0.18148	1.1866	29.121	1.79E-05
0.449	8.81784	288.1141	0.18519	1.1866	29.121	1.79E-05
0.4745	8.8654	288.1107	0.18719	1.1866	29.121	1.79E-05
0.4985	8.96619	288.1027	0.19148	1.1866	29.121	1.79E-05
0.524	9.01225	288.0908	0.19346	1.1867	29.121	1.79E-05
0.5485	9.08368	288.0795	0.19655	1.1867	29.121	1.79E-05
0.574	9.14736	288.06	0.19933	1.1868	29.121	1.79E-05
0.5985	9.22714	288.0692	0.20281	1.1868	29.121	1.79E-05
0.6485	9.30435	288.0461	0.20624	1.1869	29.121	1.79E-05
0.698	9.44339	288.0571	0.21244	1.1868	29.121	1.79E-05
0.748	9.58741	288.0807	0.21895	1.1867	29.121	1.79E-05
0.798	9.68246	288.0612	0.22333	1.1868	29.121	1.79E-05
0.848	9.77809	288.0777	0.22775	1.1867	29.121	1.79E-05
0.8975	9.91677	288.0637	0.23427	1.1868	29.121	1.79E-05
0.9475	9.97702	288.0672	0.23712	1.1868	29.121	1.79E-05
0.9975	10.09626	288.0615	0.24282	1.1868	29.121	1.79E-05
1.047	10.16894	288.0526	0.24634	1.1868	29.121	1.79E-05
1.097	10.28794	288.0459	0.25215	1.1869	29.121	1.79E-05
1.147	10.37298	288.0377	0.25634	1.1869	29.121	1.79E-05
1.197	10.46027	288.0489	0.26066	1.1869	29.121	1.79E-05
1.2725	10.56597	288.0565	0.26595	1.1868	29.121	1.79E-05
1.3465	10.6677	288.0106	0.27114	1.187	29.121	1.79E-05
1.421	10.75528	288.0309	0.27559	1.1869	29.121	1.79E-05
1.496	10.81968	287.9924	0.27894	1.1871	29.121	1.79E-05
1.571	10.86488	287.9973	0.28127	1.1871	29.121	1.79E-05
1.6455	10.90349	287.9831	0.28329	1.1871	29.121	1.79E-05
1.72	10.93016	287.986	0.28468	1.1871	29.121	1.79E-05
1.795	10.93353	287.9757	0.28486	1.1872	29.121	1.79E-05
1.87	10.98041	287.9965	0.28729	1.1871	29.121	1.79E-05
1.9445	10.9799	288.0127	0.28724	1.187	29.121	1.79E-05
2.019	10.97331	288.018	0.28689	1.187	29.121	1.79E-05
2.0945	10.97348	287.9944	0.28693	1.1871	29.121	1.79E-05
2.1685	10.95807	288.0206	0.28609	1.187	29.121	1.79E-05
2.244	10.97039	288.0028	0.28676	1.1871	29.121	1.79E-05
2.318	10.96162	288.0104	0.28629	1.187	29.121	1.79E-05
2.3935	10.96414	288.0083	0.28642	1.187	29.121	1.79E-05
2.4675	10.94869	288.0102	0.28562	1.187	29.121	1.79E-05
2.543	10.96425	287.9979	0.28644	1.1871	29.121	1.79E-05
2.617	10.95642	287.9985	0.28603	1.1871	29.121	1.79E-05
2.693	10.9583	288.0028	0.28612	1.1871	29.121	1.79E-05
2.767	10.94926	288.0412	0.28561	1.1869	29.121	1.79E-05
2.842	10.947	288.0286	0.28551	1.1869	29.121	1.79E-05
2.9165	10.94661	288.0159	0.2855	1.187	29.121	1.79E-05
2.9915	10.95623	288.0135	0.28601	1.187	29.121	1.79E-05
3.091	10.94718	288.0407	0.2855	1.1869	29.121	1.79E-05
3.191	10.94631	288.0307	0.28547	1.1869	29.121	1.79E-05
3.2905	10.94783	288.0346	0.28554	1.1869	29.121	1.79E-05
3.3905	10.94392	288.0371	0.28534	1.1869	29.121	1.79E-05
3.49	10.92926	288.0211	0.28459	1.187	29.121	1.79E-05
3.59	10.92996	288.041	0.28461	1.1869	29.121	1.79E-05
3.69	10.91791	288.026	0.28399	1.187	29.121	1.79E-05
3.79	10.92553	288.0083	0.28441	1.187	29.121	1.79E-05

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y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.001	3.82069	288.2054	0.03476	1.1861	29.121	1.80E-05
0.0015	3.90693	288.2238	0.03634	1.1861	29.121	1.80E-05
0.0025	3.88809	288.2163	0.03599	1.1861	29.121	1.80E-05
0.004	3.85099	288.206	0.03531	1.1861	29.121	1.80E-05
0.005	3.90995	288.2257	0.0364	1.1861	29.121	1.80E-05
0.0065	3.97274	288.2062	0.03758	1.1861	29.121	1.80E-05
0.0075	3.99392	288.2226	0.03798	1.1861	29.121	1.80E-05
0.0085	4.00318	288.2341	0.03815	1.186	29.121	1.80E-05
0.0095	3.97469	288.2187	0.03761	1.1861	29.121	1.80E-05
0.01	4.00813	288.2294	0.03825	1.186	29.121	1.80E-05
0.011	4.07322	288.206	0.0395	1.1861	29.121	1.80E-05
0.012	4.13075	288.2302	0.04062	1.186	29.121	1.80E-05
0.0125	4.11826	288.2206	0.04038	1.1861	29.121	1.80E-05
0.0135	4.13961	288.2263	0.0408	1.1861	29.121	1.80E-05
0.015	4.1067	288.2251	0.04015	1.1861	29.121	1.80E-05
0.016	4.15454	288.2081	0.04109	1.1861	29.121	1.80E-05
0.018	4.15746	288.2152	0.04115	1.1861	29.121	1.80E-05
0.02	4.19682	288.2357	0.04193	1.186	29.121	1.80E-05
0.022	4.26384	288.2132	0.04328	1.1861	29.121	1.80E-05
0.024	4.24317	288.2132	0.04286	1.1861	29.121	1.80E-05
0.0265	4.23176	288.2007	0.04264	1.1862	29.121	1.80E-05
0.0285	4.27437	288.2132	0.0435	1.1861	29.121	1.80E-05
0.03	4.27029	288.1937	0.04342	1.1862	29.121	1.80E-05
0.032	4.39028	288.1915	0.04589	1.1862	29.121	1.80E-05
0.0335	4.34393	288.1927	0.04493	1.1862	29.121	1.80E-05
0.036	4.32525	288.2308	0.04454	1.186	29.121	1.80E-05
0.038	4.3838	288.2202	0.04575	1.1861	29.121	1.80E-05
0.04	4.42261	288.215	0.04657	1.1861	29.121	1.80E-05
0.0415	4.36575	288.2107	0.04538	1.1861	29.121	1.80E-05
0.044	4.39066	288.2144	0.0459	1.1861	29.121	1.80E-05
0.0465	4.41909	288.2177	0.04649	1.1861	29.121	1.80E-05
0.0485	4.45527	288.2142	0.04726	1.1861	29.121	1.80E-05
0.05	4.45364	288.1894	0.04723	1.1862	29.121	1.80E-05
0.055	4.52307	288.2089	0.04871	1.1861	29.121	1.80E-05
0.06	4.50608	288.1978	0.04834	1.1862	29.121	1.80E-05
0.065	4.53269	288.213	0.04891	1.1861	29.121	1.80E-05
0.0705	4.57649	288.2319	0.04986	1.186	29.121	1.80E-05
0.075	4.63445	288.2386	0.05113	1.186	29.121	1.80E-05
0.08	4.67529	288.2686	0.05203	1.1859	29.121	1.80E-05
0.085	4.71509	288.2117	0.05293	1.1861	29.121	1.80E-05
0.0905	4.74135	288.2261	0.05352	1.1861	29.121	1.80E-05
0.095	4.77579	288.2212	0.0543	1.1861	29.121	1.80E-05
0.1	4.82428	288.2204	0.05541	1.1861	29.121	1.80E-05
0.11	4.88368	288.2273	0.05678	1.186	29.121	1.80E-05
0.12	4.97903	288.2517	0.05901	1.1859	29.121	1.80E-05
0.13	5.07675	288.2294	0.06136	1.186	29.121	1.80E-05
0.14	5.20585	288.238	0.06452	1.186	29.121	1.80E-05
0.15	5.26983	288.2727	0.0661	1.1858	29.121	1.80E-05
0.16	5.3901	288.304	0.06915	1.1857	29.121	1.80E-05
0.1705	5.5605	288.3295	0.07358	1.1856	29.121	1.80E-05
0.18	5.62626	288.351	0.07532	1.1855	29.121	1.80E-05
0.19	5.75463	288.4181	0.07878	1.1852	29.121	1.80E-05
0.2	5.86912	288.4345	0.08194	1.1851	29.121	1.80E-05
0.225	6.1657	288.4486	0.09043	1.1851	29.121	1.80E-05
0.25	6.38474	288.4683	0.09696	1.185	29.121	1.80E-05

0.275	6.63331	288.5069	0.10464	1.1848	29.121	1.80E-05
0.3	6.86316	288.5303	0.11201	1.1847	29.121	1.80E-05
0.325	6.97618	288.5065	0.11574	1.1848	29.121	1.80E-05
0.35	7.19741	288.5046	0.12319	1.1848	29.121	1.80E-05
0.375	7.34551	288.5331	0.1283	1.1847	29.121	1.80E-05
0.4	7.43626	288.5413	0.13149	1.1846	29.121	1.80E-05
0.425	7.561	288.5454	0.13594	1.1846	29.121	1.80E-05
0.45	7.66378	288.5573	0.13965	1.1846	29.121	1.80E-05
0.475	7.68935	288.5612	0.14058	1.1845	29.121	1.80E-05
0.5	7.78011	288.5666	0.14392	1.1845	29.121	1.80E-05
0.525	7.85342	288.5588	0.14665	1.1846	29.121	1.80E-05
0.55	7.93488	288.5508	0.14971	1.1846	29.121	1.80E-05
0.575	7.99772	288.5604	0.15208	1.1845	29.121	1.80E-05
0.6	8.06534	288.5354	0.15468	1.1847	29.121	1.80E-05
0.65	8.21265	288.5274	0.16039	1.1847	29.121	1.80E-05
0.6995	8.31544	288.5467	0.16442	1.1846	29.121	1.80E-05
0.75	8.49182	288.5401	0.17147	1.1846	29.121	1.80E-05
0.7995	8.64477	288.5333	0.17771	1.1847	29.121	1.80E-05
0.8495	8.82105	288.551	0.18501	1.1846	29.121	1.80E-05
0.899	8.90191	288.5723	0.18841	1.1845	29.121	1.80E-05
0.9495	9.0724	288.5475	0.19571	1.1846	29.121	1.80E-05
0.999	9.22054	288.5816	0.20213	1.1845	29.121	1.80E-05
1.0495	9.33265	288.5559	0.20709	1.1846	29.121	1.80E-05
1.099	9.48189	288.5403	0.21378	1.1846	29.121	1.80E-05
1.149	9.59671	288.5432	0.21899	1.1846	29.121	1.80E-05
1.1985	9.68507	288.5284	0.22305	1.1847	29.121	1.80E-05
1.273	9.85914	288.5256	0.23114	1.1847	29.121	1.80E-05
1.3485	10.03372	288.5309	0.2394	1.1847	29.121	1.80E-05
1.4225	10.20209	288.5457	0.24749	1.1846	29.121	1.80E-05
1.498	10.31773	288.5493	0.25312	1.1846	29.121	1.80E-05
1.5725	10.42968	288.5333	0.25866	1.1847	29.121	1.80E-05
1.648	10.5281	288.529	0.26357	1.1847	29.121	1.80E-05
1.722	10.59189	288.5377	0.26677	1.1846	29.121	1.80E-05
1.7975	10.68686	288.5342	0.27158	1.1847	29.121	1.80E-05
1.872	10.7332	288.5719	0.2739	1.1845	29.121	1.80E-05
1.9475	10.79258	288.551	0.27696	1.1846	29.121	1.80E-05
2.0215	10.86112	288.5477	0.28049	1.1846	29.121	1.80E-05
2.0965	10.87849	288.5504	0.28139	1.1846	29.121	1.80E-05
2.1715	10.91378	288.5633	0.2832	1.1845	29.121	1.80E-05
2.247	10.94188	288.5668	0.28466	1.1845	29.121	1.80E-05
2.321	10.95525	288.5762	0.28534	1.1845	29.121	1.80E-05
2.396	10.97454	288.5805	0.28634	1.1845	29.121	1.80E-05
2.471	10.99402	288.584	0.28736	1.1844	29.121	1.80E-05
2.546	11.00239	288.5783	0.2878	1.1845	29.121	1.80E-05
2.6205	10.98875	288.584	0.28708	1.1844	29.121	1.80E-05
2.6955	10.9946	288.5883	0.28738	1.1844	29.121	1.80E-05
2.7705	10.99928	288.601	0.28761	1.1844	29.121	1.80E-05
2.8455	10.98238	288.5951	0.28674	1.1844	29.121	1.80E-05
2.92	10.99353	288.5973	0.28732	1.1844	29.121	1.80E-05
2.995	10.98027	288.5879	0.28663	1.1844	29.121	1.80E-05
3.0945	11.00169	288.5877	0.28775	1.1844	29.121	1.80E-05
3.194	11.00585	288.6029	0.28796	1.1844	29.121	1.80E-05
3.294	10.99349	288.5947	0.28732	1.1844	29.121	1.80E-05
3.3935	11.01388	288.6129	0.28837	1.1843	29.121	1.80E-05
3.493	11.01447	288.5912	0.28842	1.1844	29.121	1.80E-05
3.5925	11.00006	288.6132	0.28764	1.1843	29.121	1.80E-05
3.6925	11.0012	288.6187	0.2877	1.1843	29.121	1.80E-05
3.792	11.02457	288.6199	0.28892	1.1843	29.121	1.80E-05

Representative Leading Edge Values				delta99 =	2.017	
Cf =	0.008022			Uinf =	10.3313	U* = 0.654307
y	u	y/delta99	u/Uinf	y+	u+	
0.0005	2.7249	0.000248	0.263752	2.18E-01	4.164561	
0.0015	2.79511	0.000744	0.270548	6.53E-01	4.271866	
0.002	2.79326	0.000992	0.270369	8.70E-01	4.269038	
0.003	3.00945	0.001487	0.291294	1.31E+00	4.599449	
0.0045	3.08824	0.002231	0.298921	1.96E+00	4.719867	
0.0055	3.15891	0.002727	0.305761	2.39E+00	4.827874	
0.007	3.31335	0.003471	0.32071	3.05E+00	5.06391	
0.008	3.41469	0.003966	0.330519	3.48E+00	5.218792	
0.0085	3.53366	0.004214	0.342034	3.70E+00	5.400618	
0.0095	3.66824	0.00471	0.355061	4.13E+00	5.606301	
0.0105	3.75743	0.005206	0.363694	4.57E+00	5.742614	
0.0115	3.89639	0.005702	0.377144	5.00E+00	5.954991	
0.0125	4.03028	0.006197	0.390104	5.44E+00	6.15962	
0.0135	4.16487	0.006693	0.403131	5.87E+00	6.365319	
0.0145	4.27375	0.007189	0.41367	6.31E+00	6.531724	
0.016	4.44495	0.007933	0.430241	6.96E+00	6.793375	
0.0185	4.60105	0.009172	0.445351	8.05E+00	7.031948	
0.02	4.83549	0.009916	0.468043	8.70E+00	7.390251	
0.0215	5.0316	0.010659	0.487025	9.35E+00	7.689973	
0.0235	5.15155	0.011651	0.498635	1.02E+01	7.873297	
0.026	5.29593	0.01289	0.51261	1.13E+01	8.093958	
0.028	5.51177	0.013882	0.533502	1.22E+01	8.423834	
0.0295	5.55284	0.014626	0.537477	1.28E+01	8.486602	
0.0315	5.69599	0.015617	0.551333	1.37E+01	8.705384	
0.0335	5.72274	0.016609	0.553923	1.46E+01	8.746267	
0.036	5.89572	0.017848	0.570666	1.57E+01	9.010638	
0.038	5.94158	0.01884	0.575105	1.65E+01	9.080728	
0.04	5.99642	0.019831	0.580413	1.74E+01	9.164541	
0.0415	6.02809	0.020575	0.583478	1.81E+01	9.212944	
0.0435	6.11511	0.021567	0.591901	1.89E+01	9.34594	
0.0455	6.16216	0.022558	0.596455	1.98E+01	9.417848	
0.048	6.23492	0.023798	0.603498	2.09E+01	9.529049	
0.0495	6.25982	0.024541	0.605908	2.15E+01	9.567105	
0.055	6.29281	0.027268	0.609101	2.39E+01	9.617525	
0.06	6.4223	0.029747	0.621635	2.61E+01	9.815429	
0.0645	6.52559	0.031978	0.631633	2.81E+01	9.973291	
0.0695	6.54044	0.034457	0.63307	3.02E+01	9.995987	
0.0745	6.65222	0.036936	0.64389	3.24E+01	10.16682	
0.0795	6.66713	0.039415	0.645333	3.46E+01	10.18961	
0.0845	6.74574	0.041894	0.652942	3.68E+01	10.30975	
0.0895	6.8263	0.044373	0.66074	3.89E+01	10.43288	
0.0945	6.809	0.046852	0.659065	4.11E+01	10.40644	
0.0995	6.91405	0.049331	0.669233	4.33E+01	10.56699	
0.1095	6.94818	0.054289	0.672537	4.76E+01	10.61915	
0.1195	6.9963	0.059246	0.677195	5.20E+01	10.69269	
0.1295	7.07849	0.064204	0.68515	5.63E+01	10.81831	
0.1395	7.07998	0.069162	0.685294	6.07E+01	10.82058	

0.1495	7.13035	0.07412	0.69017	6.50E+01	10.89757
0.1595	7.19846	0.079078	0.696762	6.94E+01	11.00166
0.169	7.29677	0.083788	0.706278	7.35E+01	11.15191
0.1795	7.33874	0.088994	0.71034	7.81E+01	11.21606
0.189	7.37317	0.093704	0.713673	8.22E+01	11.26868
0.1995	7.41331	0.098909	0.717558	8.68E+01	11.33002
0.224	7.5295	0.111056	0.728805	9.74E+01	11.5076
0.249	7.64744	0.123451	0.74022	1.08E+02	11.68785
0.2735	7.74581	0.135597	0.749742	1.19E+02	11.8382
0.299	7.84027	0.14824	0.758885	1.30E+02	11.98256
0.3235	7.86071	0.160387	0.760864	1.41E+02	12.0138
0.3485	7.97022	0.172781	0.771463	1.52E+02	12.18117
0.373	8.03996	0.184928	0.778214	1.62E+02	12.28776
0.3985	8.09878	0.197571	0.783907	1.73E+02	12.37765
0.4225	8.18832	0.20947	0.792574	1.84E+02	12.5145
0.448	8.25041	0.222112	0.798584	1.95E+02	12.60939
0.4725	8.29674	0.234259	0.803068	2.06E+02	12.6802
0.4985	8.40821	0.247149	0.813858	2.17E+02	12.85057
0.5225	8.47034	0.259048	0.819872	2.27E+02	12.94552
0.5475	8.50682	0.271443	0.823403	2.38E+02	13.00127
0.572	8.59599	0.283589	0.832034	2.49E+02	13.13756
0.598	8.64044	0.29648	0.836336	2.60E+02	13.20549
0.6475	8.72729	0.321021	0.844743	2.82E+02	13.33823
0.6975	8.89461	0.345811	0.860938	3.03E+02	13.59395
0.747	8.98207	0.370352	0.869404	3.25E+02	13.72762
0.797	9.07907	0.395141	0.878793	3.47E+02	13.87586
0.8465	9.16595	0.419683	0.887202	3.68E+02	14.00865
0.8965	9.26948	0.444472	0.897223	3.90E+02	14.16688
0.946	9.34571	0.469013	0.904602	4.12E+02	14.28338
0.996	9.44574	0.493803	0.914284	4.33E+02	14.43626
1.0455	9.51248	0.518344	0.920744	4.55E+02	14.53826
1.0955	9.61648	0.543133	0.93081	4.77E+02	14.69721
1.145	9.67977	0.567675	0.936936	4.98E+02	14.79394
1.195	9.76823	0.592464	0.945499	5.20E+02	14.92913
1.2695	9.8789	0.6294	0.956211	5.52E+02	15.09827
1.344	9.95382	0.666336	0.963462	5.85E+02	15.21278
1.419	10.04803	0.70352	0.972581	6.17E+02	15.35676
1.493	10.09429	0.740208	0.977059	6.49E+02	15.42746
1.5685	10.16891	0.77764	0.984282	6.82E+02	15.54151
1.6425	10.21041	0.814328	0.988299	7.15E+02	15.60493
1.718	10.24595	0.85176	0.991739	7.47E+02	15.65925

Representative Trailing Edge Values				delta99 =	3.0935		
				Uinf =	10.9914	U* =	0.696112
y	u	y/delta99	u/Uinf	y+	u+	Rex =	7.26E+05
						Avg Cf =	0.007798
0.001	3.04348	0.000323	0.276896	4.60E-01	4.37211		
0.002	3.11269	0.000647	0.283193	9.21E-01	4.471534		
0.003	3.19847	0.00097	0.290998	1.38E+00	4.594761		
0.004	3.25858	0.001293	0.296466	1.84E+00	4.681112		
0.005	3.40767	0.001616	0.310031	2.30E+00	4.895287		
0.006	3.43705	0.00194	0.312704	2.76E+00	4.937493		
0.0065	3.56032	0.002101	0.323919	2.99E+00	5.114577		
0.008	3.63746	0.002586	0.330937	3.68E+00	5.225392		
0.009	3.69597	0.002909	0.33626	4.14E+00	5.309445		
0.01	3.78589	0.003233	0.344441	4.60E+00	5.438619		
0.0115	3.90368	0.003717	0.355158	5.29E+00	5.60783		
0.0125	3.97918	0.004041	0.362027	5.75E+00	5.71629		
0.0135	4.02931	0.004364	0.366588	6.21E+00	5.788304		
0.0145	4.03193	0.004687	0.366826	6.67E+00	5.792068		
0.015	4.10076	0.004849	0.373088	6.90E+00	5.890946		
0.016	4.16717	0.005172	0.37913	7.36E+00	5.986347		
0.018	4.28261	0.005819	0.389633	8.28E+00	6.152182		
0.02	4.38425	0.006465	0.39888	9.21E+00	6.298193		
0.0225	4.49614	0.007273	0.40906	1.04E+01	6.458929		
0.024	4.59039	0.007758	0.417635	1.10E+01	6.594323		
0.026	4.64449	0.008405	0.422557	1.20E+01	6.672041		
0.028	4.68018	0.009051	0.425804	1.29E+01	6.723311		
0.0305	4.78273	0.009859	0.435134	1.40E+01	6.870629		
0.0325	4.87966	0.010506	0.443953	1.50E+01	7.009874		
0.0345	4.91095	0.011152	0.446799	1.59E+01	7.054824		
0.036	4.95075	0.011637	0.45042	1.66E+01	7.111998		
0.038	4.96848	0.012284	0.452033	1.75E+01	7.137468		
0.04	5.02305	0.01293	0.456998	1.84E+01	7.215861		
0.0425	5.08477	0.013738	0.462613	1.96E+01	7.304525		
0.044	5.1778	0.014223	0.471077	2.03E+01	7.438167		
0.046	5.20861	0.01487	0.47388	2.12E+01	7.482427		
0.048	5.1694	0.015516	0.470313	2.21E+01	7.4261		
0.0505	5.2351	0.016325	0.476291	2.32E+01	7.520481		
0.055	5.35818	0.017779	0.487488	2.53E+01	7.697292		
0.06	5.41866	0.019396	0.492991	2.76E+01	7.784174		
0.065	5.44056	0.021012	0.494983	2.99E+01	7.815635		
0.0705	5.5052	0.02279	0.500864	3.24E+01	7.908493		
0.075	5.55581	0.024244	0.505469	3.45E+01	7.981197		
0.08	5.60767	0.025861	0.510187	3.68E+01	8.055697		
0.085	5.66093	0.027477	0.515033	3.91E+01	8.132207		
0.0905	5.65642	0.029255	0.514622	4.17E+01	8.125728		
0.095	5.72093	0.03071	0.520491	4.37E+01	8.2184		
0.1	5.73008	0.032326	0.521324	4.60E+01	8.231545		
0.1105	5.78346	0.03572	0.52618	5.09E+01	8.308228		
0.12	5.85537	0.038791	0.532723	5.52E+01	8.41153		
0.1305	5.86962	0.042185	0.534019	6.01E+01	8.432001		
0.14	5.89095	0.045256	0.53596	6.44E+01	8.462642		

0.1505	5.95148	0.04865	0.541467	6.93E+01	8.549597
0.16	5.96699	0.051721	0.542878	7.36E+01	8.571878
0.1705	6.08494	0.055116	0.553609	7.85E+01	8.741319
0.18	6.08215	0.058187	0.553355	8.28E+01	8.737311
0.1905	6.12278	0.061581	0.557052	8.77E+01	8.795678
0.2	6.16285	0.064652	0.560697	9.21E+01	8.85324
0.225	6.28967	0.072733	0.572236	1.04E+02	9.035424
0.2505	6.41786	0.080976	0.583898	1.15E+02	9.219575
0.275	6.48076	0.088896	0.589621	1.27E+02	9.309934
0.3	6.61378	0.096978	0.601723	1.38E+02	9.501024
0.325	6.8042	0.105059	0.619048	1.50E+02	9.774571
0.3505	6.89367	0.113302	0.627188	1.61E+02	9.9031
0.375	7.03145	0.121222	0.639723	1.73E+02	10.10103
0.3995	7.10474	0.129142	0.646391	1.84E+02	10.20631
0.4245	7.21683	0.137223	0.656589	1.95E+02	10.36733
0.45	7.25535	0.145466	0.660093	2.07E+02	10.42267
0.475	7.43871	0.153548	0.676775	2.19E+02	10.68608
0.4995	7.50157	0.161468	0.682494	2.30E+02	10.77638
0.5245	7.67622	0.169549	0.698384	2.41E+02	11.02727
0.5495	7.70523	0.177631	0.701024	2.53E+02	11.06895
0.5745	7.83645	0.185712	0.712962	2.64E+02	11.25745
0.5995	7.8785	0.193793	0.716788	2.76E+02	11.31786
0.6495	8.04427	0.209956	0.731869	2.99E+02	11.55599
0.699	8.22136	0.225958	0.747981	3.22E+02	11.81039
0.749	8.39278	0.242121	0.763577	3.45E+02	12.05665
0.799	8.60434	0.258283	0.782825	3.68E+02	12.36056
0.849	8.70932	0.274446	0.792376	3.91E+02	12.51137
0.8985	8.87616	0.290448	0.807555	4.14E+02	12.75104
0.9485	8.97344	0.306611	0.816406	4.37E+02	12.89079
0.9985	9.10042	0.322774	0.827958	4.60E+02	13.07321
1.0485	9.20853	0.338936	0.837794	4.83E+02	13.22851
1.098	9.38703	0.354938	0.854034	5.05E+02	13.48494
1.148	9.46108	0.371101	0.860771	5.28E+02	13.59131
1.1975	9.61428	0.387102	0.874709	5.51E+02	13.81139
1.2735	9.71304	0.41167	0.883695	5.86E+02	13.95326
1.3475	9.89061	0.435591	0.89985	6.20E+02	14.20835
1.4225	10.01836	0.459835	0.911473	6.55E+02	14.39187
1.497	10.14171	0.483918	0.922695	6.89E+02	14.56907
1.5725	10.28696	0.508324	0.93591	7.24E+02	14.77773
1.6465	10.37596	0.532245	0.944007	7.58E+02	14.90558
1.7215	10.47038	0.556489	0.952597	7.92E+02	15.04122
1.796	10.54299	0.580572	0.959204	8.27E+02	15.14553
1.8715	10.6206	0.604978	0.966265	8.61E+02	15.25702
1.946	10.69758	0.629061	0.973268	8.96E+02	15.36761
2.0205	10.73455	0.653144	0.976632	9.30E+02	15.42071
2.0955	10.7822	0.677388	0.980967	9.64E+02	15.48917
2.1705	10.8336	0.701632	0.985643	9.99E+02	15.563
2.245	10.85652	0.725715	0.987729	1.03E+03	15.59593
2.3195	10.87089	0.749798	0.989036	1.07E+03	15.61657
2.395	10.89031	0.774204	0.990803	1.10E+03	15.64447

APPENDIX D

Erosion/Deposit #1 Panel Skin Friction Data

9:30 AM
100

1

Vmean (m/	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
3.12569	286.3956	0.02334	1.1901	29.057	1.79E-05
3.06059	286.3825	0.02238	1.1901	29.057	1.79E-05
3.27188	286.3774	0.02557	1.1902	29.057	1.79E-05
3.43041	286.3715	0.02811	1.1902	29.057	1.79E-05
3.55699	286.3917	0.03022	1.1901	29.057	1.79E-05
3.64737	286.4058	0.03178	1.19	29.057	1.79E-05
3.6453	286.4144	0.03174	1.19	29.057	1.79E-05
3.72318	286.4218	0.03311	1.19	29.057	1.79E-05
3.87716	286.4152	0.03591	1.19	29.057	1.79E-05
4.03822	286.424	0.03895	1.19	29.057	1.79E-05
4.15372	286.4361	0.04121	1.1899	29.057	1.79E-05
4.19387	286.4341	0.04201	1.1899	29.057	1.79E-05
4.28051	286.4746	0.04376	1.1897	29.057	1.79E-05
4.47032	286.4611	0.04772	1.1898	29.057	1.79E-05
4.53371	286.4394	0.04909	1.1899	29.057	1.79E-05
4.59024	286.4601	0.05032	1.1898	29.057	1.79E-05
4.86491	286.448	0.05652	1.1898	29.057	1.79E-05
5.02586	286.4593	0.06032	1.1898	29.057	1.79E-05
5.24404	286.484	0.06567	1.1897	29.057	1.79E-05
5.36025	286.4711	0.06861	1.1897	29.057	1.79E-05
5.5095	286.4781	0.07249	1.1897	29.057	1.79E-05
5.57569	286.4799	0.07424	1.1897	29.057	1.79E-05
5.68826	286.482	0.07727	1.1897	29.057	1.79E-05
5.73737	286.4996	0.0786	1.1896	29.057	1.79E-05
5.88311	286.5043	0.08264	1.1896	29.057	1.79E-05
5.90237	286.5086	0.08318	1.1896	29.057	1.79E-05
5.97227	286.4981	0.08517	1.1896	29.057	1.79E-05
6.0363	286.5157	0.087	1.1895	29.057	1.79E-05
6.15379	286.5088	0.09042	1.1896	29.057	1.79E-05
6.21174	286.5125	0.09213	1.1895	29.057	1.79E-05
6.28693	286.525	0.09437	1.1895	29.057	1.79E-05
6.32865	286.4983	0.09564	1.1896	29.057	1.79E-05
6.36065	286.509	0.0966	1.1896	29.057	1.79E-05
6.45208	286.5313	0.09939	1.1895	29.057	1.79E-05
6.57611	286.5237	0.10325	1.1895	29.057	1.79E-05
6.61403	286.5207	0.10445	1.1895	29.057	1.79E-05
6.66385	286.5262	0.10602	1.1895	29.057	1.79E-05
6.67707	286.5432	0.10644	1.1894	29.057	1.79E-05
6.74175	286.5131	0.10852	1.1895	29.057	1.79E-05
6.8229	286.5321	0.11114	1.1895	29.057	1.79E-05
6.86644	286.5209	0.11257	1.1895	29.057	1.79E-05
6.86232	286.5342	0.11243	1.1894	29.057	1.79E-05
6.98436	286.534	0.11647	1.1894	29.057	1.79E-05
6.99738	286.5092	0.11691	1.1896	29.057	1.79E-05
7.07032	286.5467	0.11934	1.1894	29.057	1.79E-05
7.17281	286.536	0.12283	1.1894	29.057	1.79E-05
7.20522	286.5489	0.12394	1.1894	29.057	1.79E-05
7.31327	286.57	0.12767	1.1893	29.057	1.79E-05
7.35375	286.5489	0.1291	1.1894	29.057	1.79E-05
7.4263	286.5634	0.13166	1.1893	29.057	1.79E-05
7.42637	286.5327	0.13167	1.1895	29.057	1.79E-05
7.46941	286.5679	0.13319	1.1893	29.057	1.79E-05
7.51636	286.551	0.13487	1.1894	29.057	1.79E-05
7.57573	286.5649	0.13701	1.1893	29.057	1.79E-05
7.68029	286.5692	0.14081	1.1893	29.057	1.79E-05

7.75154	286.5628	0.14344	1.1893	29.057	1.79E-05
7.90985	286.5671	0.14936	1.1893	29.057	1.79E-05
7.95845	286.5851	0.15119	1.1892	29.057	1.79E-05
8.02324	286.5692	0.15367	1.1893	29.057	1.79E-05
8.13541	286.5944	0.15798	1.1892	29.057	1.79E-05
8.21569	286.596	0.16111	1.1892	29.057	1.79E-05
8.27509	286.6075	0.16344	1.1891	29.057	1.79E-05
8.32902	286.6191	0.16557	1.1891	29.057	1.79E-05
8.38683	286.6005	0.16789	1.1891	29.057	1.79E-05
8.44824	286.604	0.17036	1.1891	29.057	1.79E-05
8.50153	286.6107	0.17251	1.1891	29.057	1.79E-05
8.59367	286.6263	0.17626	1.189	29.057	1.79E-05
8.61841	286.6316	0.17727	1.189	29.057	1.79E-05
8.71733	286.6337	0.18136	1.189	29.057	1.79E-05
8.83957	286.6488	0.18647	1.1889	29.057	1.79E-05
8.95541	286.6369	0.1914	1.189	29.057	1.79E-05
9.06972	286.6646	0.1963	1.1888	29.057	1.79E-05
9.17182	286.638	0.20076	1.189	29.057	1.79E-05
9.27226	286.6572	0.20517	1.1889	29.057	1.79E-05
9.37583	286.6869	0.20975	1.1887	29.057	1.79E-05
9.45635	286.6762	0.21338	1.1888	29.057	1.79E-05
9.5554	286.6953	0.21786	1.1887	29.057	1.79E-05
9.61689	286.6967	0.22067	1.1887	29.057	1.79E-05
9.73864	286.6828	0.2263	1.1888	29.057	1.79E-05
9.81762	286.6994	0.22997	1.1887	29.057	1.79E-05
9.87605	286.6979	0.23272	1.1887	29.057	1.79E-05
9.97533	286.7156	0.23741	1.1886	29.057	1.79E-05
10.02432	286.7248	0.23974	1.1886	29.057	1.79E-05
10.10585	286.7002	0.24367	1.1887	29.057	1.79E-05
10.19135	286.7215	0.24779	1.1886	29.057	1.79E-05
10.24458	286.7225	0.25039	1.1886	29.057	1.79E-05
10.30471	286.7338	0.25333	1.1885	29.057	1.79E-05
10.35293	286.7197	0.25572	1.1886	29.057	1.79E-05
10.37249	286.7272	0.25667	1.1886	29.057	1.79E-05
10.37327	286.7272	0.25671	1.1886	29.057	1.79E-05
10.38849	286.7332	0.25746	1.1885	29.057	1.79E-05
10.39177	286.7387	0.25762	1.1885	29.057	1.79E-05
10.40569	286.7024	0.25835	1.1887	29.057	1.79E-05
10.41655	286.727	0.25886	1.1886	29.057	1.79E-05
10.41608	286.7323	0.25883	1.1885	29.057	1.79E-05
10.41838	286.7409	0.25894	1.1885	29.057	1.79E-05
10.42844	286.75	0.25943	1.1885	29.057	1.79E-05
10.44056	286.7383	0.26004	1.1885	29.057	1.79E-05
10.43292	286.7465	0.25966	1.1885	29.057	1.79E-05
10.43463	286.751	0.25974	1.1885	29.057	1.79E-05
10.43325	286.7659	0.25965	1.1884	29.057	1.79E-05
10.46456	286.7762	0.2612	1.1883	29.057	1.79E-05
10.45791	286.7671	0.26088	1.1884	29.057	1.79E-05
10.45733	286.7676	0.26085	1.1884	29.057	1.79E-05
10.44266	286.7659	0.26012	1.1884	29.057	1.79E-05
10.44478	286.7684	0.26022	1.1884	29.057	1.79E-05
10.4521	286.7733	0.26058	1.1883	29.057	1.79E-05
10.46079	286.7678	0.26102	1.1884	29.057	1.79E-05
10.46673	286.7788	0.26131	1.1883	29.057	1.79E-05
10.45237	286.7874	0.26058	1.1883	29.057	1.79E-05
10.46143	286.7919	0.26103	1.1883	29.057	1.79E-05
10.46158	286.821	0.26101	1.1881	29.057	1.79E-05
10.47434	286.8353	0.26163	1.1881	29.057	1.79E-05

10/5/00	11:12 AM	2					
Rel Humidi	100						
y (cm)	Vmean (m/	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)	
0	4.24589	288.5578	0.0427	1.1801	29.057	1.80E-05	
0.001	4.26766	288.5455	0.04315	1.1802	29.057	1.80E-05	
0.0015	4.17446	288.55	0.04128	1.1802	29.057	1.80E-05	
0.0025	4.22603	288.5471	0.04231	1.1802	29.057	1.80E-05	
0.0035	4.29163	288.55	0.04363	1.1802	29.057	1.80E-05	
0.0045	4.38275	288.5736	0.0455	1.1801	29.057	1.80E-05	
0.0055	4.4336	288.6017	0.04656	1.1799	29.057	1.80E-05	
0.006	4.42668	288.5775	0.04641	1.1801	29.057	1.80E-05	
0.007	4.40658	288.5641	0.046	1.1801	29.057	1.80E-05	
0.0075	4.46708	288.5541	0.04727	1.1802	29.057	1.80E-05	
0.0085	4.55902	288.6021	0.04923	1.1799	29.057	1.80E-05	
0.0095	4.58186	288.5822	0.04973	1.18	29.057	1.80E-05	
0.0105	4.57829	288.6154	0.04964	1.1799	29.057	1.80E-05	
0.0115	4.53031	288.5627	0.04862	1.1801	29.057	1.80E-05	
0.013	4.61323	288.5935	0.05041	1.18	29.057	1.80E-05	
0.014	4.60607	288.5887	0.05025	1.18	29.057	1.80E-05	
0.016	4.5635	288.5836	0.04933	1.18	29.057	1.80E-05	
0.018	4.65762	288.5701	0.05139	1.1801	29.057	1.80E-05	
0.02	4.69902	288.5994	0.0523	1.18	29.057	1.80E-05	
0.022	4.77688	288.5932	0.05405	1.18	29.057	1.80E-05	
0.0245	4.88487	288.5914	0.05652	1.18	29.057	1.80E-05	
0.0265	4.84398	288.6072	0.05557	1.1799	29.057	1.80E-05	
0.028	4.89272	288.6123	0.05669	1.1799	29.057	1.80E-05	
0.0295	4.94328	288.5959	0.05788	1.18	29.057	1.80E-05	
0.032	4.9461	288.6086	0.05794	1.1799	29.057	1.80E-05	
0.034	5.00346	288.5859	0.0593	1.18	29.057	1.80E-05	
0.036	4.9956	288.609	0.0591	1.1799	29.057	1.80E-05	
0.038	4.98273	288.5838	0.05881	1.18	29.057	1.80E-05	
0.0395	4.9263	288.5953	0.05748	1.18	29.057	1.80E-05	
0.042	4.98461	288.5867	0.05885	1.18	29.057	1.80E-05	
0.0445	5.06233	288.592	0.0607	1.18	29.057	1.80E-05	
0.046	5.04121	288.5775	0.0602	1.1801	29.057	1.80E-05	
0.048	5.06915	288.6039	0.06086	1.1799	29.057	1.80E-05	
0.053	5.14338	288.6012	0.06266	1.1799	29.057	1.80E-05	
0.058	5.14702	288.6136	0.06274	1.1799	29.057	1.80E-05	
0.0635	5.14812	288.5967	0.06277	1.18	29.057	1.80E-05	
0.068	5.15676	288.5764	0.06299	1.1801	29.057	1.80E-05	
0.073	5.26821	288.6242	0.06573	1.1798	29.057	1.80E-05	
0.0775	5.28296	288.5887	0.06611	1.18	29.057	1.80E-05	
0.083	5.33675	288.5982	0.06746	1.18	29.057	1.80E-05	
0.0875	5.37482	288.5838	0.06843	1.18	29.057	1.80E-05	
0.0925	5.39815	288.5807	0.06902	1.18	29.057	1.80E-05	
0.0975	5.33725	288.5811	0.06747	1.18	29.057	1.80E-05	
0.1075	5.38131	288.5766	0.06859	1.1801	29.057	1.80E-05	
0.1175	5.46469	288.5709	0.07074	1.1801	29.057	1.80E-05	
0.1275	5.46033	288.5867	0.07062	1.18	29.057	1.80E-05	
0.1375	5.55551	288.5725	0.07311	1.1801	29.057	1.80E-05	
0.1475	5.54198	288.5814	0.07275	1.18	29.057	1.80E-05	
0.1575	5.55406	288.593	0.07306	1.18	29.057	1.80E-05	
0.1675	5.60508	288.5887	0.07441	1.18	29.057	1.80E-05	
0.1775	5.73526	288.5785	0.07791	1.1801	29.057	1.80E-05	
0.1875	5.68467	288.5914	0.07654	1.18	29.057	1.80E-05	
0.197	5.68408	288.5918	0.07652	1.18	29.057	1.80E-05	
0.2225	5.92804	288.5623	0.08324	1.1801	29.057	1.80E-05	
0.247	6.11639	288.5555	0.08862	1.1802	29.057	1.80E-05	

0.272	6.15883	288.5614	0.08985	1.1801	29.057	1.80E-05
0.2965	6.21082	288.5565	0.09138	1.1802	29.057	1.80E-05
0.322	6.3367	288.5571	0.09512	1.1802	29.057	1.80E-05
0.347	6.38581	288.5479	0.0966	1.1802	29.057	1.80E-05
0.371	6.45962	288.5896	0.09883	1.18	29.057	1.80E-05
0.3965	6.60316	288.5407	0.10329	1.1802	29.057	1.80E-05
0.421	6.71192	288.5506	0.10672	1.1802	29.057	1.80E-05
0.4465	6.85651	288.5526	0.11136	1.1802	29.057	1.80E-05
0.4705	6.94045	288.5467	0.11411	1.1802	29.057	1.80E-05
0.496	7.04172	288.5272	0.11747	1.1803	29.057	1.80E-05
0.5205	7.14291	288.5424	0.12087	1.1802	29.057	1.80E-05
0.546	7.1884	288.5524	0.12241	1.1802	29.057	1.80E-05
0.57	7.28284	288.5518	0.12564	1.1802	29.057	1.80E-05
0.5955	7.35596	288.5215	0.1282	1.1803	29.057	1.80E-05
0.6455	7.61146	288.5578	0.13724	1.1801	29.057	1.80E-05
0.695	7.76155	288.5362	0.14271	1.1802	29.057	1.80E-05
0.7455	7.92698	288.5034	0.14888	1.1804	29.057	1.80E-05
0.795	8.08622	288.519	0.15491	1.1803	29.057	1.80E-05
0.845	8.21329	288.518	0.15982	1.1803	29.057	1.80E-05
0.8945	8.38453	288.5325	0.16655	1.1803	29.057	1.80E-05
0.9445	8.55903	288.5405	0.17354	1.1802	29.057	1.80E-05
0.994	8.64791	288.5159	0.17718	1.1803	29.057	1.80E-05
1.044	8.73464	288.5251	0.18075	1.1803	29.057	1.80E-05
1.093	8.95489	288.5245	0.18998	1.1803	29.057	1.80E-05
1.143	9.08697	288.5496	0.19561	1.1802	29.057	1.80E-05
1.1925	9.18751	288.5317	0.19997	1.1803	29.057	1.80E-05
1.267	9.36138	288.5409	0.20761	1.1802	29.057	1.80E-05
1.342	9.45108	288.513	0.21163	1.1804	29.057	1.80E-05
1.4165	9.62467	288.5048	0.21948	1.1804	29.057	1.80E-05
1.4905	9.75428	288.5225	0.22542	1.1803	29.057	1.80E-05
1.566	9.84809	288.5309	0.22976	1.1803	29.057	1.80E-05
1.64	9.97514	288.5098	0.23575	1.1804	29.057	1.80E-05
1.7155	10.07787	288.5374	0.24061	1.1802	29.057	1.80E-05
1.7895	10.17247	288.5089	0.24517	1.1804	29.057	1.80E-05
1.8655	10.24587	288.5116	0.24872	1.1804	29.057	1.80E-05
1.9395	10.26423	288.5206	0.2496	1.1803	29.057	1.80E-05
2.015	10.30691	288.5155	0.25169	1.1803	29.057	1.80E-05
2.0895	10.37	288.5149	0.25478	1.1803	29.057	1.80E-05
2.1655	10.41323	288.5089	0.25691	1.1804	29.057	1.80E-05
2.2395	10.42177	288.5215	0.25732	1.1803	29.057	1.80E-05
2.315	10.44047	288.5046	0.25826	1.1804	29.057	1.80E-05
2.3895	10.45652	288.5251	0.25904	1.1803	29.057	1.80E-05
2.4655	10.46666	288.4975	0.25957	1.1804	29.057	1.80E-05
2.5395	10.49577	288.5124	0.261	1.1804	29.057	1.80E-05
2.615	10.50634	288.4895	0.26155	1.1805	29.057	1.80E-05
2.6895	10.49442	288.4776	0.26097	1.1805	29.057	1.80E-05
2.7655	10.52062	288.5048	0.26224	1.1804	29.057	1.80E-05
2.8395	10.50864	288.504	0.26165	1.1804	29.057	1.80E-05
2.915	10.53061	288.5233	0.26272	1.1803	29.057	1.80E-05
2.9895	10.54566	288.4989	0.2635	1.1804	29.057	1.80E-05
3.089	10.5072	288.4952	0.26158	1.1804	29.057	1.80E-05
3.1895	10.49021	288.4796	0.26076	1.1805	29.057	1.80E-05
3.2895	10.50228	288.4778	0.26136	1.1805	29.057	1.80E-05
3.389	10.55868	288.4796	0.26417	1.1805	29.057	1.80E-05
3.489	10.51226	288.505	0.26183	1.1804	29.057	1.80E-05
3.589	10.53238	288.4737	0.26286	1.1805	29.057	1.80E-05
3.689	10.56892	288.4804	0.26468	1.1805	29.057	1.80E-05
3.789	10.52863	288.4814	0.26267	1.1805	29.057	1.80E-05

10/5/00	9:47 AM	LEC				
Rel Humidi	100					
y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0	2.11589	286.9564	0.01067	1.1875	29.057	1.79E-05
0.0005	2.13953	286.9361	0.01091	1.1876	29.057	1.79E-05
0.0015	2.15512	286.9353	0.01107	1.1876	29.057	1.79E-05
0.0025	2.36407	286.9172	0.01332	1.1877	29.057	1.79E-05
0.0035	2.55148	286.9658	0.01552	1.1875	29.057	1.79E-05
0.0045	2.76378	286.9496	0.01821	1.1875	29.057	1.79E-05
0.006	2.95482	286.967	0.02081	1.1875	29.057	1.79E-05
0.007	3.15107	286.9699	0.02367	1.1874	29.057	1.79E-05
0.008	3.34793	286.9412	0.02672	1.1876	29.057	1.79E-05
0.0085	3.52964	286.965	0.02969	1.1875	29.057	1.79E-05
0.0095	3.60622	286.9435	0.031	1.1876	29.057	1.79E-05
0.0105	3.72072	286.9535	0.033	1.1875	29.057	1.79E-05
0.0115	3.9477	286.9703	0.03714	1.1874	29.057	1.79E-05
0.0125	4.10412	286.9666	0.04015	1.1875	29.057	1.79E-05
0.0135	4.28939	286.9674	0.04385	1.1875	29.057	1.79E-05
0.015	4.36618	286.9664	0.04544	1.1875	29.057	1.79E-05
0.017	4.69476	286.984	0.05253	1.1874	29.057	1.79E-05
0.019	4.90606	286.9848	0.05737	1.1874	29.057	1.79E-05
0.0205	5.04442	286.9928	0.06064	1.1873	29.057	1.79E-05
0.0225	5.23822	286.9924	0.06539	1.1873	29.057	1.79E-05
0.0245	5.5259	286.9998	0.07277	1.1873	29.057	1.79E-05
0.027	5.62539	286.9981	0.07542	1.1873	29.057	1.79E-05
0.0285	5.77852	286.9957	0.07958	1.1873	29.057	1.79E-05
0.0305	5.83407	287.016	0.08111	1.1872	29.057	1.79E-05
0.0325	6.00488	287.0141	0.08593	1.1872	29.057	1.79E-05
0.035	6.08061	286.9938	0.08812	1.1873	29.057	1.79E-05
0.037	6.13757	287.0344	0.08976	1.1871	29.057	1.79E-05
0.039	6.27526	287.0309	0.09384	1.1872	29.057	1.79E-05
0.0405	6.3447	287.0287	0.09593	1.1872	29.057	1.79E-05
0.0425	6.36838	287.0239	0.09664	1.1872	29.057	1.79E-05
0.0445	6.43311	287.0416	0.09861	1.1871	29.057	1.79E-05
0.047	6.47173	287.0207	0.09981	1.1872	29.057	1.79E-05
0.0485	6.49499	287.0575	0.10051	1.187	29.057	1.79E-05
0.0535	6.60661	287.0366	0.10401	1.1871	29.057	1.79E-05
0.0585	6.66145	287.0328	0.10574	1.1872	29.057	1.79E-05
0.0635	6.71004	287.0063	0.1073	1.1873	29.057	1.79E-05
0.0685	6.78303	286.9803	0.10966	1.1874	29.057	1.79E-05
0.074	6.80739	286.9574	0.11046	1.1875	29.057	1.79E-05
0.079	6.79	286.9643	0.10989	1.1875	29.057	1.79E-05
0.0835	6.92268	286.967	0.11423	1.1875	29.057	1.79E-05
0.0885	6.93291	286.9271	0.11458	1.1876	29.057	1.79E-05
0.094	6.95993	286.9412	0.11547	1.1876	29.057	1.79E-05
0.099	7.0358	286.9764	0.11798	1.1874	29.057	1.79E-05
0.1085	7.11041	286.9408	0.12052	1.1876	29.057	1.79E-05
0.119	7.12055	286.9746	0.12085	1.1874	29.057	1.79E-05
0.1285	7.26022	286.9557	0.12564	1.1875	29.057	1.79E-05
0.1385	7.32409	286.9639	0.12786	1.1875	29.057	1.79E-05
0.1485	7.3969	286.9496	0.13042	1.1875	29.057	1.79E-05
0.1585	7.41092	286.9564	0.13091	1.1875	29.057	1.79E-05
0.1685	7.4501	286.9463	0.1323	1.1876	29.057	1.79E-05
0.179	7.49698	286.9584	0.13397	1.1875	29.057	1.79E-05
0.1885	7.55352	286.965	0.13599	1.1875	29.057	1.79E-05
0.199	7.57965	286.9693	0.13693	1.1874	29.057	1.79E-05
0.2235	7.75041	286.9731	0.14317	1.1874	29.057	1.79E-05
0.2485	7.82292	286.9936	0.14585	1.1873	29.057	1.79E-05

0.2735	7.91098	286.9858	0.14916	1.1874	29.057	1.79E-05
0.2985	7.94267	286.9705	0.15036	1.1874	29.057	1.79E-05
0.3235	8.02066	286.9889	0.15332	1.1874	29.057	1.79E-05
0.3485	8.14013	286.9742	0.15793	1.1874	29.057	1.79E-05
0.3735	8.18874	286.9654	0.15983	1.1875	29.057	1.79E-05
0.3985	8.23202	286.966	0.16152	1.1875	29.057	1.79E-05
0.4235	8.31922	286.9637	0.16496	1.1875	29.057	1.79E-05
0.4485	8.39806	286.9629	0.1681	1.1875	29.057	1.79E-05
0.4735	8.46135	286.9727	0.17064	1.1874	29.057	1.79E-05
0.4985	8.51941	286.939	0.17301	1.1876	29.057	1.79E-05
0.5235	8.58562	286.9654	0.1757	1.1875	29.057	1.79E-05
0.5485	8.61066	286.9607	0.17673	1.1875	29.057	1.79E-05
0.5735	8.71871	286.9594	0.18119	1.1875	29.057	1.79E-05
0.5985	8.7085	286.9643	0.18076	1.1875	29.057	1.79E-05
0.6485	8.80521	286.9645	0.1848	1.1875	29.057	1.79E-05
0.6985	8.98744	286.9709	0.19252	1.1874	29.057	1.79E-05
0.748	9.0318	286.9699	0.19443	1.1874	29.057	1.79E-05
0.7985	9.1363	286.9795	0.19895	1.1874	29.057	1.79E-05
0.848	9.2245	286.9838	0.2028	1.1874	29.057	1.79E-05
0.8985	9.28605	287.0057	0.2055	1.1873	29.057	1.79E-05
0.948	9.45903	286.9555	0.21327	1.1875	29.057	1.79E-05
0.998	9.51345	286.9781	0.21571	1.1874	29.057	1.79E-05
1.0475	9.6195	286.9731	0.22055	1.1874	29.057	1.79E-05
1.098	9.65406	286.9865	0.22213	1.1874	29.057	1.79E-05
1.1475	9.74335	286.9985	0.22624	1.1873	29.057	1.79E-05
1.1975	9.84083	286.9785	0.23081	1.1874	29.057	1.79E-05
1.272	9.92637	286.9936	0.23483	1.1873	29.057	1.79E-05
1.347	10.03971	287.0037	0.24021	1.1873	29.057	1.79E-05
1.4215	10.07851	287.0078	0.24207	1.1873	29.057	1.79E-05
1.497	10.20344	287.0037	0.24811	1.1873	29.057	1.79E-05
1.571	10.21514	286.9879	0.2487	1.1874	29.057	1.79E-05
1.6465	10.30678	287.0002	0.25317	1.1873	29.057	1.79E-05
1.721	10.31692	286.9842	0.25368	1.1874	29.057	1.79E-05
1.7965	10.3167	286.9838	0.25367	1.1874	29.057	1.79E-05
1.8705	10.31588	286.9754	0.25364	1.1874	29.057	1.79E-05
1.9455	10.33663	286.983	0.25465	1.1874	29.057	1.79E-05
2.0205	10.45878	286.956	0.26073	1.1875	29.057	1.79E-05
2.096	10.4397	286.985	0.25975	1.1874	29.057	1.79E-05
2.17	10.44663	286.9654	0.26012	1.1875	29.057	1.79E-05
2.245	10.44062	286.9732	0.25981	1.1874	29.057	1.79E-05
2.32	10.41299	286.9951	0.25842	1.1873	29.057	1.79E-05
2.395	10.42628	286.9969	0.25907	1.1873	29.057	1.79E-05
2.4695	10.45557	287.0031	0.26052	1.1873	29.057	1.79E-05
2.5445	10.44839	287.0377	0.26013	1.1871	29.057	1.79E-05
2.6195	10.45913	287.0557	0.26065	1.187	29.057	1.79E-05
2.6945	10.49194	287.0821	0.26226	1.1869	29.057	1.79E-05
2.769	10.44078	287.1135	0.25968	1.1868	29.057	1.79E-05
2.8435	10.43728	287.0911	0.25953	1.1869	29.057	1.79E-05
2.919	10.43165	287.1413	0.2592	1.1867	29.057	1.79E-05
2.9935	10.39472	287.1204	0.25738	1.1868	29.057	1.79E-05
3.0935	10.43966	287.1085	0.25963	1.1868	29.057	1.79E-05
3.193	10.45953	287.1368	0.26059	1.1867	29.057	1.79E-05
3.293	10.44085	287.1358	0.25966	1.1867	29.057	1.79E-05
3.3925	10.42308	287.1272	0.25878	1.1867	29.057	1.79E-05
3.492	10.44191	287.1622	0.25968	1.1866	29.057	1.79E-05
3.5915	10.42062	287.1497	0.25864	1.1866	29.057	1.79E-05
3.6915	10.41934	287.1532	0.25857	1.1866	29.057	1.79E-05
3.7915	10.4548	287.1479	0.26034	1.1866	29.057	1.79E-05

10/5/00 10:52 AM		TEC				
Rel Humidi 100						
y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.001	3.76771	288.2737	0.03366	1.1815	29.057	1.80E-05
0.002	3.76691	288.2884	0.03365	1.1814	29.057	1.80E-05
0.0035	3.82778	288.2792	0.03475	1.1814	29.057	1.80E-05
0.0045	3.83553	288.2735	0.03489	1.1815	29.057	1.80E-05
0.006	3.82702	288.278	0.03473	1.1814	29.057	1.80E-05
0.0065	3.80309	288.2915	0.0343	1.1814	29.057	1.80E-05
0.0075	3.83466	288.3003	0.03487	1.1813	29.057	1.80E-05
0.0085	3.81786	288.2928	0.03456	1.1814	29.057	1.80E-05
0.009	3.87537	288.2917	0.03561	1.1814	29.057	1.80E-05
0.01	3.83131	288.286	0.03481	1.1814	29.057	1.80E-05
0.011	3.83439	288.2843	0.03486	1.1814	29.057	1.80E-05
0.012	3.79263	288.2993	0.03411	1.1813	29.057	1.80E-05
0.013	3.73231	288.2966	0.03303	1.1813	29.057	1.80E-05
0.0145	3.93974	288.2745	0.03681	1.1814	29.057	1.80E-05
0.0155	3.97849	288.2751	0.03754	1.1814	29.057	1.80E-05
0.0165	3.96568	288.2911	0.03729	1.1814	29.057	1.80E-05
0.0185	3.97518	288.311	0.03747	1.1813	29.057	1.80E-05
0.02	4.00551	288.293	0.03804	1.1814	29.057	1.80E-05
0.0225	3.9994	288.304	0.03793	1.1813	29.057	1.80E-05
0.025	4.05798	288.2938	0.03905	1.1814	29.057	1.80E-05
0.027	4.05652	288.2921	0.03902	1.1814	29.057	1.80E-05
0.0285	4.07823	288.2977	0.03944	1.1813	29.057	1.80E-05
0.03	4.09162	288.2885	0.0397	1.1814	29.057	1.80E-05
0.032	4.1041	288.2901	0.03994	1.1814	29.057	1.80E-05
0.0345	4.02595	288.3005	0.03843	1.1813	29.057	1.80E-05
0.0365	4.09298	288.3008	0.03972	1.1813	29.057	1.80E-05
0.0385	4.03361	288.3143	0.03858	1.1813	29.057	1.80E-05
0.04	4.15856	288.3145	0.041	1.1813	29.057	1.80E-05
0.0425	4.02365	288.344	0.03838	1.1811	29.057	1.80E-05
0.045	4.00181	288.3508	0.03797	1.1811	29.057	1.80E-05
0.047	4.112	288.334	0.04009	1.1812	29.057	1.80E-05
0.0485	4.1474	288.3469	0.04078	1.1811	29.057	1.80E-05
0.05	4.21329	288.3557	0.04208	1.1811	29.057	1.80E-05
0.0555	4.17104	288.3721	0.04124	1.181	29.057	1.80E-05
0.06	4.19403	288.3631	0.0417	1.181	29.057	1.80E-05
0.066	4.2448	288.3547	0.04272	1.1811	29.057	1.80E-05
0.07	4.2682	288.3522	0.04319	1.1811	29.057	1.80E-05
0.0755	4.29506	288.3163	0.04374	1.1813	29.057	1.80E-05
0.08	4.31476	288.287	0.04415	1.1814	29.057	1.80E-05
0.086	4.38317	288.27	0.04556	1.1815	29.057	1.80E-05
0.09	4.36161	288.2805	0.04511	1.1814	29.057	1.80E-05
0.0955	4.33025	288.2347	0.04447	1.1816	29.057	1.80E-05
0.1	4.36713	288.2304	0.04524	1.1817	29.057	1.80E-05
0.11	4.46111	288.2009	0.04721	1.1818	29.057	1.80E-05
0.12	4.44914	288.2011	0.04696	1.1818	29.057	1.80E-05
0.13	4.51866	288.2099	0.04843	1.1817	29.057	1.80E-05
0.14	4.56433	288.2031	0.04942	1.1818	29.057	1.80E-05
0.15	4.64845	288.181	0.05126	1.1819	29.057	1.80E-05
0.16	4.69964	288.1986	0.05239	1.1818	29.057	1.80E-05
0.17	4.74935	288.2117	0.0535	1.1817	29.057	1.80E-05
0.18	4.82843	288.2109	0.0553	1.1817	29.057	1.80E-05
0.19	4.85872	288.1921	0.056	1.1818	29.057	1.80E-05
0.2	4.8918	288.1923	0.05677	1.1818	29.057	1.80E-05
0.226	5.0367	288.1757	0.06018	1.1819	29.057	1.80E-05
0.25	5.22806	288.1882	0.06484	1.1818	29.057	1.80E-05

0.2755	5.32105	288.204	0.06716	1.1818	29.057	1.80E-05
0.2995	5.4665	288.2111	0.07088	1.1817	29.057	1.80E-05
0.3255	5.65882	288.2191	0.07596	1.1817	29.057	1.80E-05
0.35	5.7184	288.215	0.07756	1.1817	29.057	1.80E-05
0.375	5.84594	288.2029	0.08107	1.1818	29.057	1.80E-05
0.3995	6.01396	288.1955	0.0858	1.1818	29.057	1.80E-05
0.4255	6.14242	288.1898	0.0895	1.1818	29.057	1.80E-05
0.4495	6.24213	288.1783	0.09244	1.1819	29.057	1.80E-05
0.475	6.40399	288.2134	0.09728	1.1817	29.057	1.80E-05
0.4995	6.57551	288.2025	0.10256	1.1818	29.057	1.80E-05
0.525	6.69915	288.1915	0.10646	1.1818	29.057	1.80E-05
0.5495	6.83822	288.1947	0.11093	1.1818	29.057	1.80E-05
0.5745	6.94139	288.2009	0.1143	1.1818	29.057	1.80E-05
0.599	7.03708	288.2056	0.11747	1.1818	29.057	1.80E-05
0.649	7.26298	288.2173	0.12512	1.1817	29.057	1.80E-05
0.699	7.49223	288.2159	0.13315	1.1817	29.057	1.80E-05
0.749	7.70137	288.1976	0.14069	1.1818	29.057	1.80E-05
0.799	7.85093	288.22	0.1462	1.1817	29.057	1.80E-05
0.849	8.06117	288.2152	0.15414	1.1817	29.057	1.80E-05
0.8985	8.22152	288.204	0.16034	1.1818	29.057	1.80E-05
0.9485	8.30553	288.2341	0.16361	1.1816	29.057	1.80E-05
0.9985	8.50184	288.2007	0.17146	1.1818	29.057	1.80E-05
1.0485	8.67039	288.2079	0.17832	1.1818	29.057	1.80E-05
1.098	8.83959	288.1865	0.18536	1.1819	29.057	1.80E-05
1.148	8.9583	288.2384	0.19034	1.1816	29.057	1.80E-05
1.198	9.04936	288.2236	0.19424	1.1817	29.057	1.80E-05
1.2725	9.25972	288.2271	0.20337	1.1817	29.057	1.80E-05
1.348	9.42831	288.2136	0.21085	1.1817	29.057	1.80E-05
1.422	9.45933	288.2314	0.21223	1.1816	29.057	1.80E-05
1.497	9.66534	288.2206	0.22158	1.1817	29.057	1.80E-05
1.5715	9.7773	288.2323	0.22674	1.1816	29.057	1.80E-05
1.647	9.86264	288.23	0.23071	1.1817	29.057	1.80E-05
1.721	9.98327	288.2522	0.23637	1.1816	29.057	1.80E-05
1.796	10.00778	288.2359	0.23755	1.1816	29.057	1.80E-05
1.8705	10.09484	288.2444	0.24169	1.1816	29.057	1.80E-05
1.946	10.16265	288.2374	0.24496	1.1816	29.057	1.80E-05
2.02	10.22401	288.2511	0.24791	1.1816	29.057	1.80E-05
2.095	10.26635	288.2398	0.24998	1.1816	29.057	1.80E-05
2.1695	10.31347	288.2704	0.25225	1.1815	29.057	1.80E-05
2.245	10.34333	288.2261	0.25375	1.1817	29.057	1.80E-05
2.319	10.37166	288.2423	0.25513	1.1816	29.057	1.80E-05
2.394	10.39302	288.2464	0.25618	1.1816	29.057	1.80E-05
2.469	10.38932	288.2753	0.25597	1.1814	29.057	1.80E-05
2.544	10.41921	288.2602	0.25746	1.1815	29.057	1.80E-05
2.6185	10.43068	288.2649	0.25802	1.1815	29.057	1.80E-05
2.693	10.42722	288.2673	0.25785	1.1815	29.057	1.80E-05
2.7685	10.42358	288.2649	0.25767	1.1815	29.057	1.80E-05
2.843	10.46457	288.2755	0.25969	1.1814	29.057	1.80E-05
2.9175	10.46731	288.2657	0.25983	1.1815	29.057	1.80E-05
2.992	10.46756	288.2608	0.25985	1.1815	29.057	1.80E-05
3.092	10.45734	288.2704	0.25933	1.1815	29.057	1.80E-05
3.1915	10.45655	288.2813	0.25928	1.1814	29.057	1.80E-05
3.2915	10.47031	288.3143	0.25993	1.1813	29.057	1.80E-05
3.391	10.46983	288.3553	0.25987	1.1811	29.057	1.80E-05
3.491	10.4742	288.3578	0.26008	1.1811	29.057	1.80E-05
3.5905	10.47664	288.3785	0.26018	1.181	29.057	1.80E-05
3.6905	10.477	288.3746	0.26021	1.181	29.057	1.80E-05
3.7905	10.49085	288.4152	0.26085	1.1808	29.057	1.80E-05

10/5/00 10:03 AM 7
 Rel Humidi 100
 y (cm) Vmean (m) T (degK) DP ("H2O) density (kg Patm ("Hg) viscosity (kg/ms)

0	2.67323	287.3421	0.01701	1.1857	29.057	1.79E-05
0.0005	2.57622	287.3001	0.0158	1.1859	29.057	1.79E-05
0.0015	2.8276	287.3265	0.01903	1.1858	29.057	1.79E-05
0.0025	2.85352	287.3013	0.01938	1.1859	29.057	1.79E-05
0.003	3.07036	287.3031	0.02244	1.1859	29.057	1.79E-05
0.004	3.0663	287.3175	0.02238	1.1858	29.057	1.79E-05
0.005	3.21537	287.315	0.02461	1.1859	29.057	1.79E-05
0.0065	3.25822	287.3205	0.02527	1.1858	29.057	1.79E-05
0.0075	3.42718	287.3132	0.02796	1.1859	29.057	1.79E-05
0.0085	3.52928	287.2906	0.02965	1.186	29.057	1.79E-05
0.0095	3.66232	287.3013	0.03193	1.1859	29.057	1.79E-05
0.0105	3.85223	287.3146	0.03532	1.1859	29.057	1.79E-05
0.011	3.94288	287.296	0.03701	1.1859	29.057	1.79E-05
0.012	4.04129	287.3019	0.03888	1.1859	29.057	1.79E-05
0.013	4.12413	287.3115	0.04049	1.1859	29.057	1.79E-05
0.014	4.13791	287.324	0.04075	1.1858	29.057	1.79E-05
0.0165	4.43877	287.3253	0.0469	1.1858	29.057	1.79E-05
0.019	4.70997	287.3126	0.0528	1.1859	29.057	1.79E-05
0.0205	4.87153	287.3152	0.05649	1.1859	29.057	1.79E-05
0.022	4.95396	287.3253	0.05841	1.1858	29.057	1.79E-05
0.024	5.09648	287.3136	0.06183	1.1859	29.057	1.79E-05
0.0265	5.29611	287.3365	0.06676	1.1858	29.057	1.79E-05
0.0285	5.55309	287.3324	0.0734	1.1858	29.057	1.79E-05
0.0305	5.59384	287.3392	0.07447	1.1857	29.057	1.79E-05
0.032	5.74336	287.3416	0.07851	1.1857	29.057	1.79E-05
0.0345	5.89578	287.3599	0.08272	1.1857	29.057	1.79E-05
0.037	6.01599	287.3197	0.08615	1.1858	29.057	1.79E-05
0.039	6.08329	287.3273	0.08808	1.1858	29.057	1.79E-05
0.0405	6.08501	287.3439	0.08813	1.1857	29.057	1.79E-05
0.0425	6.07464	287.3337	0.08783	1.1858	29.057	1.79E-05
0.044	6.25589	287.3703	0.09314	1.1856	29.057	1.79E-05
0.0465	6.28482	287.3441	0.09401	1.1857	29.057	1.79E-05
0.0485	6.30826	287.3304	0.09472	1.1858	29.057	1.79E-05
0.0535	6.44731	287.3523	0.09893	1.1857	29.057	1.79E-05
0.059	6.61216	287.3388	0.10406	1.1857	29.057	1.79E-05
0.063	6.70389	287.3603	0.10696	1.1856	29.057	1.79E-05
0.0685	6.72254	287.3255	0.10757	1.1858	29.057	1.79E-05
0.073	6.78684	287.3628	0.10962	1.1856	29.057	1.79E-05
0.079	6.82741	287.3697	0.11093	1.1856	29.057	1.79E-05
0.083	6.90616	287.3466	0.11351	1.1857	29.057	1.79E-05
0.0885	6.88864	287.3609	0.11293	1.1856	29.057	1.79E-05
0.093	6.93331	287.3587	0.1144	1.1857	29.057	1.79E-05
0.099	7.0149	287.3642	0.11711	1.1856	29.057	1.79E-05
0.1085	7.17131	287.374	0.12238	1.1856	29.057	1.79E-05
0.119	7.17943	287.3527	0.12267	1.1857	29.057	1.79E-05
0.1285	7.23437	287.3611	0.12455	1.1856	29.057	1.79E-05
0.139	7.32905	287.3511	0.12784	1.1857	29.057	1.79E-05
0.1485	7.34138	287.3851	0.12825	1.1855	29.057	1.79E-05
0.159	7.45814	287.3966	0.13236	1.1855	29.057	1.79E-05
0.1685	7.49292	287.4023	0.13359	1.1855	29.057	1.79E-05
0.179	7.46704	287.3822	0.13268	1.1855	29.057	1.79E-05
0.1885	7.61502	287.4003	0.13798	1.1855	29.057	1.79E-05
0.199	7.5218	287.3978	0.13463	1.1855	29.057	1.79E-05
0.223	7.68388	287.3951	0.14049	1.1855	29.057	1.79E-05
0.2485	7.83867	287.3982	0.14621	1.1855	29.057	1.79E-05

0.273	7.92579	287.4324	0.14946	1.1853	29.057	1.79E-05
0.299	7.99196	287.4267	0.15197	1.1853	29.057	1.79E-05
0.323	8.08807	287.4199	0.15565	1.1854	29.057	1.79E-05
0.3485	8.20153	287.4043	0.16005	1.1854	29.057	1.79E-05
0.373	8.18104	287.422	0.15925	1.1854	29.057	1.79E-05
0.399	8.32465	287.4203	0.16489	1.1854	29.057	1.79E-05
0.423	8.30921	287.4103	0.16428	1.1854	29.057	1.79E-05
0.4485	8.47714	287.3937	0.171	1.1855	29.057	1.79E-05
0.473	8.46009	287.3949	0.17031	1.1855	29.057	1.79E-05
0.499	8.52514	287.4103	0.17293	1.1854	29.057	1.79E-05
0.523	8.6711	287.3962	0.17891	1.1855	29.057	1.79E-05
0.5485	8.70083	287.3992	0.18014	1.1855	29.057	1.79E-05
0.573	8.73971	287.3929	0.18176	1.1855	29.057	1.79E-05
0.599	8.77046	287.4308	0.18301	1.1853	29.057	1.79E-05
0.6485	8.95797	287.4091	0.19094	1.1854	29.057	1.79E-05
0.6985	9.03783	287.4093	0.19436	1.1854	29.057	1.79E-05
0.7485	9.13397	287.4027	0.19852	1.1855	29.057	1.79E-05
0.7985	9.26375	287.4295	0.20418	1.1853	29.057	1.79E-05
0.848	9.40077	287.4205	0.21027	1.1854	29.057	1.79E-05
0.8985	9.50144	287.4218	0.2148	1.1854	29.057	1.79E-05
0.948	9.62427	287.4445	0.22037	1.1853	29.057	1.79E-05
0.998	9.66415	287.424	0.22221	1.1854	29.057	1.79E-05
1.0475	9.75638	287.4099	0.22649	1.1854	29.057	1.79E-05
1.098	9.85979	287.4023	0.23132	1.1855	29.057	1.79E-05
1.1475	9.95817	287.4273	0.23594	1.1853	29.057	1.79E-05
1.1975	10.04407	287.4197	0.24003	1.1854	29.057	1.79E-05
1.272	10.15685	287.4162	0.24546	1.1854	29.057	1.79E-05
1.347	10.26558	287.407	0.25075	1.1854	29.057	1.79E-05
1.4215	10.35751	287.4527	0.25522	1.1852	29.057	1.79E-05
1.497	10.39633	287.44	0.25715	1.1853	29.057	1.79E-05
1.571	10.43081	287.4648	0.25883	1.1852	29.057	1.79E-05
1.646	10.54263	287.4554	0.26442	1.1852	29.057	1.79E-05
1.721	10.55486	287.4679	0.26502	1.1852	29.057	1.79E-05
1.796	10.58014	287.4629	0.26629	1.1852	29.057	1.79E-05
1.8705	10.56758	287.4574	0.26567	1.1852	29.057	1.79E-05
1.9455	10.59031	287.48	0.26679	1.1851	29.057	1.79E-05
2.0205	10.56124	287.4654	0.26534	1.1852	29.057	1.79E-05
2.0955	10.54199	287.4767	0.26436	1.1851	29.057	1.79E-05
2.17	10.50254	287.4871	0.26238	1.1851	29.057	1.79E-05
2.245	10.50692	287.4982	0.26259	1.185	29.057	1.79E-05
2.32	10.56583	287.4923	0.26554	1.185	29.057	1.79E-05
2.3945	10.55618	287.4849	0.26507	1.1851	29.057	1.79E-05
2.4695	10.59109	287.4992	0.26681	1.185	29.057	1.79E-05
2.544	10.61051	287.5043	0.26778	1.185	29.057	1.79E-05
2.6195	10.60299	287.5177	0.26739	1.1849	29.057	1.79E-05
2.694	10.60373	287.5125	0.26743	1.1849	29.057	1.79E-05
2.769	10.61202	287.5097	0.26785	1.185	29.057	1.79E-05
2.8435	10.61787	287.5215	0.26814	1.1849	29.057	1.79E-05
2.919	10.60466	287.515	0.26748	1.1849	29.057	1.79E-05
2.993	10.5681	287.5369	0.26561	1.1848	29.057	1.79E-05
3.093	10.56594	287.5506	0.26549	1.1848	29.057	1.79E-05
3.193	10.57618	287.5443	0.26601	1.1848	29.057	1.79E-05
3.2925	10.59899	287.5582	0.26715	1.1847	29.057	1.79E-05
3.3925	10.60045	287.5607	0.26722	1.1847	29.057	1.79E-05
3.4925	10.61064	287.5978	0.26769	1.1846	29.057	1.79E-05
3.592	10.59034	287.6035	0.26666	1.1845	29.057	1.79E-05
3.6915	10.57587	287.606	0.26593	1.1845	29.057	1.79E-05
3.7915	10.58496	287.605	0.26639	1.1845	29.057	1.79E-05

10/5/00	10:28 AM	8				
Rel Humidi	100					
y (cm)	Vmean (m)	T (degK)	DP ("H2O)	density (kg Patm ("Hg)	viscosity (kg/ms)	
0.001	3.97158	287.6074	0.0375	1.1845	29.057	1.79E-05
0.002	3.98299	287.5871	0.03772	1.1846	29.057	1.79E-05
0.0035	3.92462	287.5892	0.03662	1.1846	29.057	1.79E-05
0.0045	3.98752	287.6435	0.0378	1.1843	29.057	1.79E-05
0.0055	4.07872	287.6533	0.03955	1.1843	29.057	1.79E-05
0.0065	4.07714	287.6205	0.03952	1.1845	29.057	1.79E-05
0.0075	4.10419	287.6338	0.04004	1.1844	29.057	1.79E-05
0.008	4.17139	287.6474	0.04136	1.1843	29.057	1.79E-05
0.009	4.09779	287.665	0.03992	1.1842	29.057	1.79E-05
0.01	4.02052	287.68	0.03842	1.1842	29.057	1.79E-05
0.011	4.184	287.6709	0.04161	1.1842	29.057	1.79E-05
0.012	4.16806	287.6873	0.04129	1.1841	29.057	1.79E-05
0.013	4.10636	287.672	0.04008	1.1842	29.057	1.79E-05
0.0145	4.1038	287.6877	0.04003	1.1841	29.057	1.79E-05
0.0155	4.20513	287.6837	0.04203	1.1842	29.057	1.79E-05
0.016	4.28879	287.6843	0.04372	1.1842	29.057	1.79E-05
0.018	4.26411	287.6486	0.04322	1.1843	29.057	1.79E-05
0.02	4.25305	287.6982	0.04299	1.1841	29.057	1.79E-05
0.0225	4.36793	287.6859	0.04535	1.1842	29.057	1.79E-05
0.0245	4.31917	287.6794	0.04434	1.1842	29.057	1.79E-05
0.0265	4.39362	287.6972	0.04588	1.1841	29.057	1.79E-05
0.028	4.46474	287.7171	0.04737	1.184	29.057	1.79E-05
0.03	4.21911	287.7249	0.0423	1.184	29.057	1.79E-05
0.032	4.47487	287.7654	0.04758	1.1838	29.057	1.79E-05
0.0345	4.45661	287.8027	0.04719	1.1836	29.057	1.79E-05
0.036	4.37679	287.8142	0.04551	1.1836	29.057	1.79E-05
0.038	4.47669	287.8236	0.04761	1.1835	29.057	1.79E-05
0.04	4.53285	287.8345	0.04881	1.1835	29.057	1.79E-05
0.042	4.58568	287.8556	0.04995	1.1834	29.057	1.79E-05
0.0445	4.56421	287.8839	0.04948	1.1832	29.057	1.79E-05
0.0465	4.5494	287.8798	0.04916	1.1833	29.057	1.79E-05
0.048	4.54037	287.8843	0.04896	1.1832	29.057	1.79E-05
0.0495	4.57678	287.8931	0.04975	1.1832	29.057	1.79E-05
0.0555	4.74134	287.8989	0.05339	1.1832	29.057	1.79E-05
0.06	4.78724	287.9081	0.05443	1.1831	29.057	1.79E-05
0.0655	4.76603	287.9149	0.05394	1.1831	29.057	1.79E-05
0.0695	4.76373	287.9181	0.05389	1.1831	29.057	1.79E-05
0.075	4.83489	287.9421	0.05551	1.183	29.057	1.79E-05
0.0795	4.90559	287.9352	0.05714	1.183	29.057	1.79E-05
0.0855	4.86992	287.9313	0.05632	1.183	29.057	1.79E-05
0.0895	4.93169	287.9202	0.05776	1.1831	29.057	1.79E-05
0.095	4.84387	287.9671	0.05571	1.1829	29.057	1.79E-05
0.1	4.92647	287.9405	0.05763	1.183	29.057	1.79E-05
0.11	5.04444	287.9737	0.06041	1.1828	29.057	1.79E-05
0.12	5.14499	287.9591	0.06285	1.1829	29.057	1.79E-05
0.13	5.20814	287.9698	0.0644	1.1828	29.057	1.79E-05
0.14	5.24551	287.9872	0.06532	1.1828	29.057	1.79E-05
0.1495	5.28498	287.9686	0.06632	1.1829	29.057	1.79E-05
0.16	5.36861	287.9848	0.06843	1.1828	29.057	1.79E-05
0.1695	5.48339	287.9973	0.07138	1.1827	29.057	1.79E-05
0.1795	5.48324	287.9969	0.07138	1.1827	29.057	1.79E-05
0.1895	5.52089	288.0016	0.07236	1.1827	29.057	1.79E-05
0.2	5.58061	288.0038	0.07393	1.1827	29.057	1.79E-05
0.2255	5.69888	288.0086	0.0771	1.1827	29.057	1.79E-05
0.2495	5.76372	287.9971	0.07887	1.1827	29.057	1.79E-05

0.275	5.90636	287.9883	0.08282	1.1828	29.057	1.79E-05
0.2995	6.09393	287.9913	0.08816	1.1828	29.057	1.79E-05
0.3255	6.17541	287.9965	0.09053	1.1827	29.057	1.79E-05
0.3495	6.33011	288.0459	0.09511	1.1825	29.057	1.79E-05
0.375	6.44085	288.0295	0.09847	1.1826	29.057	1.79E-05
0.3995	6.51418	288.0295	0.10073	1.1826	29.057	1.79E-05
0.4255	6.65106	288.0504	0.105	1.1825	29.057	1.80E-05
0.4495	6.78834	288.0233	0.10939	1.1826	29.057	1.79E-05
0.475	6.88185	288.0475	0.11241	1.1825	29.057	1.79E-05
0.4995	7.00058	288.0574	0.11632	1.1824	29.057	1.80E-05
0.525	7.0692	288.0537	0.11861	1.1825	29.057	1.80E-05
0.5495	7.20234	288.0615	0.12312	1.1824	29.057	1.80E-05
0.5745	7.32979	288.0764	0.12751	1.1824	29.057	1.80E-05
0.599	7.42939	288.0762	0.13099	1.1824	29.057	1.80E-05
0.649	7.50854	288.0828	0.1338	1.1823	29.057	1.80E-05
0.699	7.75066	288.0522	0.14258	1.1825	29.057	1.80E-05
0.749	8.00938	288.0658	0.15225	1.1824	29.057	1.80E-05
0.799	8.19262	288.077	0.15929	1.1824	29.057	1.80E-05
0.8485	8.32861	288.0641	0.16463	1.1824	29.057	1.80E-05
0.8985	8.45229	288.058	0.16956	1.1824	29.057	1.80E-05
0.9485	8.63163	288.0479	0.17684	1.1825	29.057	1.79E-05
0.9985	8.73891	288.0522	0.18126	1.1825	29.057	1.80E-05
1.048	8.93643	288.0639	0.18954	1.1824	29.057	1.80E-05
1.098	9.04311	288.0565	0.1941	1.1825	29.057	1.80E-05
1.148	9.11229	288.0471	0.19708	1.1825	29.057	1.79E-05
1.198	9.29446	288.042	0.20505	1.1825	29.057	1.79E-05
1.2725	9.46772	288.061	0.21275	1.1824	29.057	1.80E-05
1.3475	9.63284	288.0532	0.22024	1.1825	29.057	1.80E-05
1.4225	9.78285	288.0237	0.22718	1.1826	29.057	1.79E-05
1.497	9.93113	288.0364	0.2341	1.1825	29.057	1.79E-05
1.5715	10.08345	288.0389	0.24134	1.1825	29.057	1.79E-05
1.647	10.18949	288.0567	0.24642	1.1824	29.057	1.80E-05
1.7215	10.27824	288.0801	0.25071	1.1823	29.057	1.80E-05
1.7965	10.344	288.0612	0.25395	1.1824	29.057	1.80E-05
1.871	10.42966	288.0485	0.25819	1.1825	29.057	1.79E-05
1.9465	10.44362	288.0859	0.25884	1.1823	29.057	1.80E-05
2.0205	10.47064	288.0491	0.26022	1.1825	29.057	1.80E-05
2.096	10.53636	288.0871	0.26346	1.1823	29.057	1.80E-05
2.17	10.58319	288.0668	0.26582	1.1824	29.057	1.80E-05
2.246	10.56716	288.0631	0.26502	1.1824	29.057	1.80E-05
2.3195	10.57992	288.0682	0.26566	1.1824	29.057	1.80E-05
2.395	10.57908	288.0713	0.26561	1.1824	29.057	1.80E-05
2.469	10.58757	288.0594	0.26605	1.1824	29.057	1.80E-05
2.5445	10.62648	288.0655	0.26801	1.1824	29.057	1.80E-05
2.6185	10.6404	288.0528	0.26872	1.1825	29.057	1.80E-05
2.6935	10.62673	288.069	0.26801	1.1824	29.057	1.80E-05
2.768	10.61752	288.0602	0.26756	1.1824	29.057	1.80E-05
2.8435	10.61672	288.0813	0.2675	1.1823	29.057	1.80E-05
2.9175	10.592	288.0615	0.26627	1.1824	29.057	1.80E-05
2.9925	10.58815	288.085	0.26605	1.1823	29.057	1.80E-05
3.092	10.59563	288.0844	0.26643	1.1823	29.057	1.80E-05
3.192	10.63882	288.066	0.26863	1.1824	29.057	1.80E-05
3.2915	10.61181	288.0738	0.26726	1.1824	29.057	1.80E-05
3.391	10.60221	288.0656	0.26678	1.1824	29.057	1.80E-05
3.4905	10.60612	288.091	0.26695	1.1823	29.057	1.80E-05
3.5905	10.6343	288.094	0.26837	1.1823	29.057	1.80E-05
3.6905	10.64233	288.0979	0.26877	1.1823	29.057	1.80E-05
3.79	10.63287	288.0945	0.2683	1.1823	29.057	1.80E-05

Representative Leading Edge Values				delta99 =	2.0205	
Cf =	0.007696			Uinf =	10.4416	U* = 0.647716
y	u	y/delta99	u/Uinf	y+	u+	
0.001	3.12569	0.000495	0.29935	4.30E-01	4.825711	
0.002	3.06059	0.00099	0.293115	8.60E-01	4.725204	
0.003	3.27188	0.001485	0.31335	1.29E+00	5.051412	
0.004	3.43041	0.00198	0.328533	1.72E+00	5.296164	
0.0045	3.55699	0.002227	0.340656	1.94E+00	5.491589	
0.0055	3.64737	0.002722	0.349311	2.37E+00	5.631126	
0.007	3.6453	0.003464	0.349113	3.01E+00	5.62793	
0.008	3.72318	0.003959	0.356572	3.44E+00	5.748168	
0.0095	3.87716	0.004702	0.371319	4.09E+00	5.985896	
0.0105	4.03822	0.005197	0.386743	4.52E+00	6.234554	
0.0115	4.15372	0.005692	0.397805	4.95E+00	6.412873	
0.0125	4.19387	0.006187	0.40165	5.38E+00	6.47486	
0.013	4.28051	0.006434	0.409948	5.59E+00	6.608622	
0.014	4.47032	0.006929	0.428126	6.02E+00	6.901667	
0.0145	4.53371	0.007176	0.434197	6.24E+00	6.999534	
0.0155	4.59024	0.007671	0.439611	6.67E+00	7.08681	
0.018	4.86491	0.008909	0.465916	7.74E+00	7.51087	
0.02	5.02586	0.009899	0.48133	8.60E+00	7.759358	
0.022	5.24404	0.010888	0.502226	9.46E+00	8.096203	
0.024	5.36025	0.011878	0.513355	1.03E+01	8.275618	
0.026	5.5095	0.012868	0.527649	1.12E+01	8.506044	
0.0285	5.57569	0.014105	0.533988	1.23E+01	8.608233	
0.0305	5.68826	0.015095	0.544769	1.31E+01	8.782029	
0.0325	5.73737	0.016085	0.549472	1.40E+01	8.857849	
0.034	5.88311	0.016828	0.56343	1.46E+01	9.082855	
0.0355	5.90237	0.01757	0.565274	1.53E+01	9.11259	
0.038	5.97227	0.018807	0.571969	1.63E+01	9.220508	
0.04	6.0363	0.019797	0.578101	1.72E+01	9.319363	
0.042	6.15379	0.020787	0.589353	1.81E+01	9.500754	
0.0435	6.21174	0.021529	0.594903	1.87E+01	9.590223	
0.0455	6.28693	0.022519	0.602104	1.96E+01	9.706307	
0.048	6.32865	0.023756	0.6061	2.06E+01	9.770718	
0.0505	6.36065	0.024994	0.609164	2.17E+01	9.820123	
0.0545	6.45208	0.026974	0.617921	2.34E+01	9.96128	
0.06	6.57611	0.029696	0.629799	2.58E+01	10.15277	
0.0645	6.61403	0.031923	0.633431	2.77E+01	10.21131	
0.0705	6.66385	0.034892	0.638202	3.03E+01	10.28823	
0.0745	6.67707	0.036872	0.639468	3.20E+01	10.30864	
0.08	6.74175	0.039594	0.645663	3.44E+01	10.4085	
0.0845	6.8229	0.041821	0.653434	3.63E+01	10.53378	
0.0905	6.86644	0.044791	0.657604	3.89E+01	10.60101	
0.0945	6.86232	0.046771	0.65721	4.06E+01	10.59464	
0.1	6.98436	0.049493	0.668897	4.30E+01	10.78306	
0.1105	6.99738	0.054689	0.670144	4.75E+01	10.80316	
0.12	7.07032	0.059391	0.67713	5.16E+01	10.91577	
0.1305	7.17281	0.064588	0.686945	5.61E+01	11.07401	
0.14	7.20522	0.06929	0.690049	6.02E+01	11.12404	

0.1505	7.31327	0.074487	0.700397	6.47E+01	11.29086
0.16	7.35375	0.079188	0.704274	6.88E+01	11.35336
0.1705	7.4263	0.084385	0.711222	7.33E+01	11.46537
0.18	7.42637	0.089087	0.711229	7.74E+01	11.46547
0.1905	7.46941	0.094284	0.715351	8.19E+01	11.53192
0.2	7.51636	0.098985	0.719848	8.60E+01	11.60441
0.2245	7.57573	0.111111	0.725533	9.66E+01	11.69607
0.2505	7.68029	0.123979	0.735547	1.08E+02	11.8575
0.2745	7.75154	0.135857	0.742371	1.18E+02	11.9675
0.3	7.90985	0.148478	0.757532	1.29E+02	12.21191
0.3245	7.95845	0.160604	0.762187	1.40E+02	12.28694
0.3505	8.02324	0.173472	0.768392	1.51E+02	12.38697
0.3745	8.13541	0.18535	0.779134	1.61E+02	12.56015
0.4	8.21569	0.197971	0.786823	1.72E+02	12.68409
0.4245	8.27509	0.210097	0.792512	1.83E+02	12.7758
0.45	8.32902	0.222717	0.797677	1.94E+02	12.85906
0.4745	8.38683	0.234843	0.803213	2.04E+02	12.94832
0.4995	8.44824	0.247216	0.809094	2.15E+02	13.04313
0.524	8.50153	0.259342	0.814198	2.25E+02	13.1254
0.55	8.59367	0.27221	0.823022	2.37E+02	13.26765
0.574	8.61841	0.284088	0.825392	2.47E+02	13.30585
0.5995	8.71733	0.296709	0.834865	2.58E+02	13.45857
0.6495	8.83957	0.321455	0.846572	2.79E+02	13.64729
0.6995	8.95541	0.346201	0.857666	3.01E+02	13.82614
0.7495	9.06972	0.370948	0.868614	3.22E+02	14.00262
0.799	9.17182	0.395447	0.878392	3.44E+02	14.16025
0.849	9.27226	0.420193	0.888011	3.65E+02	14.31532
0.8985	9.37583	0.444692	0.89793	3.86E+02	14.47522
0.949	9.45635	0.469686	0.905642	4.08E+02	14.59953
0.9985	9.5554	0.494185	0.915128	4.29E+02	14.75245
1.0485	9.61689	0.518931	0.921017	4.51E+02	14.84739
1.098	9.73864	0.54343	0.932677	4.72E+02	15.03536
1.148	9.81762	0.568176	0.940241	4.94E+02	15.15729
1.1975	9.87605	0.592675	0.945837	5.15E+02	15.2475
1.2725	9.97533	0.629795	0.955345	5.47E+02	15.40078
1.3475	10.02432	0.666914	0.960037	5.80E+02	15.47641
1.422	10.10585	0.703786	0.967845	6.12E+02	15.60229
1.4965	10.19135	0.740658	0.976033	6.44E+02	15.73429
1.572	10.24458	0.778025	0.981131	6.76E+02	15.81647
1.646	10.30471	0.81465	0.98689	7.08E+02	15.9093
1.7215	10.35293	0.852017	0.991508	7.40E+02	15.98375

Representative Trailing Edge Values				delta99 =	2.615		
				Uinf =	10.5219	U* =	0.652697
y	u	y/delta99	u/Uinf	y+	u+	Rex =	6.91E+05
0	4.24589	0	0.403529	0.00E+00	6.505146	Avg Cf =	0.007911
0.001	4.26766	0.000382	0.405598	4.29E-01	6.5385		
0.0015	4.17446	0.000574	0.39674	6.43E-01	6.395708		
0.0025	4.22603	0.000956	0.401641	1.07E+00	6.474718		
0.0035	4.29163	0.001338	0.407876	1.50E+00	6.575224		
0.0045	4.38275	0.001721	0.416536	1.93E+00	6.71483		
0.0055	4.4336	0.002103	0.421369	2.36E+00	6.792737		
0.006	4.42668	0.002294	0.420711	2.57E+00	6.782135		
0.007	4.40658	0.002677	0.418801	3.00E+00	6.75134		
0.0075	4.46708	0.002868	0.424551	3.22E+00	6.844032		
0.0085	4.55902	0.00325	0.433289	3.64E+00	6.984894		
0.0095	4.58186	0.003633	0.435459	4.07E+00	7.019887		
0.0105	4.57829	0.004015	0.43512	4.50E+00	7.014417		
0.0115	4.53031	0.004398	0.43056	4.93E+00	6.940907		
0.013	4.61323	0.004971	0.438441	5.57E+00	7.067949		
0.014	4.60607	0.005354	0.43776	6.00E+00	7.056979		
0.016	4.5635	0.006119	0.433714	6.86E+00	6.991757		
0.018	4.65762	0.006883	0.44266	7.72E+00	7.135959		
0.02	4.69902	0.007648	0.446594	8.58E+00	7.199388		
0.022	4.77688	0.008413	0.453994	9.43E+00	7.318678		
0.0245	4.88487	0.009369	0.464257	1.05E+01	7.48413		
0.0265	4.84398	0.010134	0.460371	1.14E+01	7.421482		
0.028	4.89272	0.010707	0.465003	1.20E+01	7.496157		
0.0295	4.94328	0.011281	0.469809	1.26E+01	7.57362		
0.032	4.9461	0.012237	0.470077	1.37E+01	7.577941		
0.034	5.00346	0.013002	0.475528	1.46E+01	7.665822		
0.036	4.9956	0.013767	0.474781	1.54E+01	7.65378		
0.038	4.98273	0.014532	0.473558	1.63E+01	7.634061		
0.0395	4.9263	0.015105	0.468195	1.69E+01	7.547605		
0.042	4.98461	0.016061	0.473737	1.80E+01	7.636942		
0.0445	5.06233	0.017017	0.481123	1.91E+01	7.756017		
0.046	5.04121	0.017591	0.479116	1.97E+01	7.723659		
0.048	5.06915	0.018356	0.481771	2.06E+01	7.766466		
0.053	5.14338	0.020268	0.488826	2.27E+01	7.880194		
0.058	5.14702	0.02218	0.489172	2.49E+01	7.885771		
0.0635	5.14812	0.024283	0.489277	2.72E+01	7.887456		
0.068	5.15676	0.026004	0.490098	2.92E+01	7.900694		
0.073	5.26821	0.027916	0.50069	3.13E+01	8.071447		
0.0775	5.28296	0.029637	0.502092	3.32E+01	8.094045		
0.083	5.33675	0.03174	0.507204	3.56E+01	8.176457		
0.0875	5.37482	0.033461	0.510822	3.75E+01	8.234784		
0.0925	5.39815	0.035373	0.513039	3.97E+01	8.270528		
0.0975	5.33725	0.037285	0.507252	4.18E+01	8.177223		
0.1075	5.38131	0.041109	0.511439	4.61E+01	8.244728		
0.1175	5.46469	0.044933	0.519363	5.04E+01	8.372474		
0.1275	5.46033	0.048757	0.518949	5.47E+01	8.365794		
0.1375	5.55551	0.052581	0.527995	5.90E+01	8.51162		

0.1475	5.54198	0.056405	0.526709	6.32E+01	8.490891
0.1575	5.55406	0.060229	0.527857	6.75E+01	8.509399
0.1675	5.60508	0.064054	0.532706	7.18E+01	8.587567
0.1775	5.73526	0.067878	0.545078	7.61E+01	8.787016
0.1875	5.68467	0.071702	0.54027	8.04E+01	8.709507
0.197	5.68408	0.075335	0.540214	8.45E+01	8.708603
0.2225	5.92804	0.085086	0.5634	9.54E+01	9.082375
0.247	6.11639	0.094455	0.581301	1.06E+02	9.370947
0.272	6.15883	0.104015	0.585334	1.17E+02	9.435969
0.2965	6.21082	0.113384	0.590276	1.27E+02	9.515623
0.322	6.3367	0.123136	0.602239	1.38E+02	9.708485
0.347	6.38581	0.132696	0.606907	1.49E+02	9.783726
0.371	6.45962	0.141874	0.613921	1.59E+02	9.896811
0.3965	6.60316	0.151625	0.627563	1.70E+02	10.11673
0.421	6.71192	0.160994	0.6379	1.81E+02	10.28336
0.4465	6.85651	0.170746	0.651642	1.91E+02	10.50489
0.4705	6.94045	0.179924	0.659619	2.02E+02	10.63349
0.496	7.04172	0.189675	0.669244	2.13E+02	10.78865
0.5205	7.14291	0.199044	0.678861	2.23E+02	10.94368
0.546	7.1884	0.208795	0.683185	2.34E+02	11.01338
0.57	7.28284	0.217973	0.69216	2.44E+02	11.15807
0.5955	7.35596	0.227725	0.699109	2.55E+02	11.2701
0.6455	7.61146	0.246845	0.723392	2.77E+02	11.66155
0.695	7.76155	0.265774	0.737657	2.98E+02	11.8915
0.7455	7.92698	0.285086	0.753379	3.20E+02	12.14496
0.795	8.08622	0.304015	0.768513	3.41E+02	12.38893
0.845	8.21329	0.323136	0.78059	3.62E+02	12.58362
0.8945	8.38453	0.342065	0.796865	3.84E+02	12.84597
0.9445	8.55903	0.361185	0.813449	4.05E+02	13.11333
0.994	8.64791	0.380115	0.821896	4.26E+02	13.2495
1.044	8.73464	0.399235	0.830139	4.48E+02	13.38238
1.093	8.95489	0.417973	0.851072	4.69E+02	13.71982
1.143	9.08697	0.437094	0.863624	4.90E+02	13.92218
1.1925	9.18751	0.456023	0.87318	5.11E+02	14.07622
1.267	9.36138	0.484512	0.889704	5.43E+02	14.34261
1.342	9.45108	0.513193	0.898229	5.75E+02	14.48004
1.4165	9.62467	0.541683	0.914727	6.07E+02	14.746
1.4905	9.75428	0.569981	0.927045	6.39E+02	14.94457
1.566	9.84809	0.598853	0.935961	6.71E+02	15.0883
1.64	9.97514	0.627151	0.948036	7.03E+02	15.28295
1.7155	10.07787	0.656023	0.957799	7.36E+02	15.44035
1.7895	10.17247	0.684321	0.96679	7.67E+02	15.58528
1.8655	10.24587	0.713384	0.973766	8.00E+02	15.69774
1.9395	10.26423	0.741683	0.975511	8.32E+02	15.72587
2.015	10.30691	0.770554	0.979567	8.64E+02	15.79126
2.0895	10.37	0.799044	0.985563	8.96E+02	15.88792
2.1655	10.41323	0.828107	0.989672	9.28E+02	15.95415
2.2395	10.42177	0.856405	0.990484	9.60E+02	15.96724

APPENDIX E

Erosion/Deposit #2 Panel Skin Friction Data

11:41 AM

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Vmean (m)	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
4.33361	288.5258	0.04601	1.2205	30	1.80E-05
4.34992	288.4962	0.04636	1.2206	30	1.80E-05
4.4515	288.4989	0.04855	1.2206	30	1.80E-05
4.49282	288.5147	0.04945	1.2205	30	1.80E-05
4.62541	288.5317	0.05241	1.2204	30	1.80E-05
4.67593	288.5625	0.05355	1.2203	30	1.80E-05
4.74223	288.5401	0.05509	1.2204	30	1.80E-05
4.85313	288.551	0.05769	1.2203	30	1.80E-05
4.9326	288.5292	0.0596	1.2204	30	1.80E-05
5.05924	288.5204	0.0627	1.2205	30	1.80E-05
5.097	288.4895	0.06365	1.2206	30	1.80E-05
5.17516	288.4634	0.06563	1.2208	30	1.80E-05
5.26279	288.3998	0.06788	1.221	30	1.80E-05
5.35285	288.3578	0.07024	1.2212	30	1.80E-05
5.4209	288.3409	0.07204	1.2213	30	1.80E-05
5.47353	288.3528	0.07344	1.2213	30	1.80E-05
5.56286	288.3436	0.07586	1.2213	30	1.80E-05
5.81217	288.3147	0.08282	1.2214	30	1.80E-05
5.88581	288.3131	0.08493	1.2214	30	1.80E-05
6.00705	288.2854	0.08848	1.2216	30	1.80E-05
6.07286	288.2766	0.09043	1.2216	30	1.80E-05
6.12464	288.28	0.09198	1.2216	30	1.80E-05
6.2058	288.2856	0.09443	1.2216	30	1.80E-05
6.30615	288.2649	0.09752	1.2217	30	1.80E-05
6.37663	288.2583	0.09971	1.2217	30	1.80E-05
6.43834	288.2825	0.10164	1.2216	30	1.80E-05
6.50155	288.2439	0.10366	1.2218	30	1.80E-05
6.54839	288.2452	0.10516	1.2218	30	1.80E-05
6.63423	288.239	0.10794	1.2218	30	1.80E-05
6.7058	288.207	0.11029	1.2219	30	1.80E-05
6.72409	288.2415	0.11088	1.2218	30	1.80E-05
6.79398	288.2243	0.11321	1.2219	30	1.80E-05
6.79794	288.2202	0.11334	1.2219	30	1.80E-05
6.91116	288.2351	0.11714	1.2218	30	1.80E-05
6.98826	288.2206	0.11977	1.2219	30	1.80E-05
7.06765	288.2405	0.1225	1.2218	30	1.80E-05
7.07685	288.2074	0.12284	1.2219	30	1.80E-05
7.15889	288.1995	0.1257	1.222	30	1.80E-05
7.20418	288.2097	0.12729	1.2219	30	1.80E-05
7.22876	288.2031	0.12817	1.222	30	1.80E-05
7.31839	288.2115	0.13136	1.2219	30	1.80E-05
7.31859	288.206	0.13137	1.2219	30	1.80E-05
7.40567	288.1968	0.13452	1.222	30	1.80E-05
7.47906	288.1927	0.1372	1.222	30	1.80E-05
7.55954	288.1912	0.14017	1.222	30	1.80E-05
7.61239	288.1915	0.14214	1.222	30	1.80E-05
7.67038	288.2035	0.14431	1.222	30	1.80E-05
7.74673	288.1995	0.1472	1.222	30	1.80E-05
7.75619	288.1793	0.14757	1.2221	30	1.80E-05
7.81873	288.2177	0.14993	1.2219	30	1.80E-05
7.84869	288.2077	0.15109	1.2219	30	1.80E-05
7.92488	288.2159	0.15403	1.2219	30	1.80E-05
7.95641	288.197	0.15527	1.222	30	1.80E-05
8.08727	288.1878	0.16043	1.222	30	1.80E-05
8.13968	288.2091	0.1625	1.2219	30	1.80E-05

8.24138	288.2089	0.16659	1.2219	30	1.80E-05
8.30937	288.1966	0.16936	1.222	30	1.80E-05
8.37028	288.2142	0.17184	1.2219	30	1.80E-05
8.4932	288.2009	0.17693	1.222	30	1.80E-05
8.57211	288.1806	0.18025	1.2221	30	1.80E-05
8.64031	288.1845	0.18312	1.222	30	1.80E-05
8.69404	288.1849	0.18541	1.222	30	1.80E-05
8.74218	288.1865	0.18747	1.222	30	1.80E-05
8.83258	288.1986	0.19135	1.222	30	1.80E-05
8.89896	288.1757	0.19426	1.2221	30	1.80E-05
8.97747	288.2074	0.19768	1.2219	30	1.80E-05
9.05349	288.1785	0.20106	1.2221	30	1.80E-05
9.10884	288.182	0.20352	1.2221	30	1.80E-05
9.14332	288.1865	0.20506	1.222	30	1.80E-05
9.25669	288.1459	0.21021	1.2222	30	1.80E-05
9.39408	288.1787	0.21647	1.2221	30	1.80E-05
9.50489	288.1673	0.22162	1.2221	30	1.80E-05
9.60136	288.1506	0.22615	1.2222	30	1.80E-05
9.69265	288.1502	0.23048	1.2222	30	1.80E-05
9.80788	288.1437	0.23599	1.2222	30	1.80E-05
9.90845	288.172	0.24083	1.2221	30	1.80E-05
9.99622	288.1301	0.24516	1.2223	30	1.80E-05
10.11734	288.1445	0.25112	1.2222	30	1.80E-05
10.18353	288.1502	0.25441	1.2222	30	1.80E-05
10.26109	288.1511	0.2583	1.2222	30	1.80E-05
10.32959	288.1269	0.26179	1.2223	30	1.80E-05
10.47013	288.1369	0.26895	1.2223	30	1.80E-05
10.56652	288.1619	0.2739	1.2222	30	1.80E-05
10.66085	288.147	0.27882	1.2222	30	1.80E-05
10.74977	288.1396	0.2835	1.2223	30	1.80E-05
10.8028	288.1705	0.28627	1.2221	30	1.80E-05
10.86024	288.1457	0.28935	1.2222	30	1.80E-05
10.90031	288.1299	0.29151	1.2223	30	1.80E-05
10.95653	288.1314	0.29452	1.2223	30	1.80E-05
10.99064	288.1467	0.29634	1.2222	30	1.80E-05
10.99296	288.1445	0.29647	1.2222	30	1.80E-05
11.02002	288.1363	0.29794	1.2223	30	1.80E-05
11.04429	288.1217	0.29927	1.2223	30	1.80E-05
11.05088	288.131	0.29962	1.2223	30	1.80E-05
11.05046	288.1732	0.29955	1.2221	30	1.80E-05
11.05154	288.1986	0.29958	1.222	30	1.80E-05
11.06021	288.2403	0.3	1.2218	30	1.80E-05
11.06442	288.2692	0.30019	1.2217	30	1.80E-05
11.07454	288.3188	0.30069	1.2214	30	1.80E-05
11.08446	288.3699	0.30117	1.2212	30	1.80E-05
11.07567	288.3803	0.30068	1.2211	30	1.80E-05
11.08801	288.3994	0.30133	1.221	30	1.80E-05
11.08056	288.4287	0.30089	1.2209	30	1.80E-05
11.09331	288.4341	0.30157	1.2209	30	1.80E-05
11.08085	288.455	0.30087	1.2208	30	1.80E-05
11.10684	288.4609	0.30228	1.2208	30	1.80E-05
11.08701	288.4661	0.3012	1.2207	30	1.80E-05
11.09429	288.4412	0.30162	1.2209	30	1.80E-05
11.11111	288.4644	0.30251	1.2207	30	1.80E-05
11.11848	288.465	0.30291	1.2207	30	1.80E-05
11.11138	288.4671	0.30252	1.2207	30	1.80E-05
11.11329	288.4513	0.30264	1.2208	30	1.80E-05
11.13078	288.4613	0.30358	1.2208	30	1.80E-05

10/3/00	9:46 AM	2				
Rel Humidi	77					
y (cm)	Vmean (m T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)	
0.001	3.03065	287.7589	0.02257	1.224	30	1.79E-05
0.0025	3.06423	287.7439	0.02307	1.2241	30	1.79E-05
0.0035	3.16747	287.7628	0.02465	1.224	30	1.79E-05
0.005	3.1951	287.7484	0.02508	1.2241	30	1.79E-05
0.006	3.22159	287.7462	0.0255	1.2241	30	1.79E-05
0.007	3.19467	287.7632	0.02507	1.224	30	1.79E-05
0.0075	3.32252	287.7462	0.02712	1.2241	30	1.79E-05
0.0085	3.35327	287.7505	0.02763	1.2241	30	1.79E-05
0.0095	3.36752	287.7398	0.02786	1.2241	30	1.79E-05
0.01	3.40364	287.7509	0.02846	1.2241	30	1.79E-05
0.011	3.51677	287.7296	0.03039	1.2242	30	1.79E-05
0.012	3.51197	287.7414	0.03031	1.2241	30	1.79E-05
0.0135	3.55826	287.7695	0.03111	1.224	30	1.79E-05
0.0145	3.59868	287.7425	0.03182	1.2241	30	1.79E-05
0.0155	3.65778	287.7601	0.03287	1.224	30	1.79E-05
0.0165	3.62207	287.7392	0.03224	1.2241	30	1.79E-05
0.0185	3.72357	287.7624	0.03406	1.224	30	1.79E-05
0.02	3.83922	287.7894	0.03621	1.2239	30	1.79E-05
0.0225	3.88435	287.7427	0.03707	1.2241	30	1.79E-05
0.025	3.90574	287.8042	0.03747	1.2238	30	1.79E-05
0.027	3.9503	287.7974	0.03833	1.2238	30	1.79E-05
0.0285	4.01266	287.8021	0.03955	1.2238	30	1.79E-05
0.03	4.03647	287.7794	0.04003	1.2239	30	1.79E-05
0.032	4.09861	287.8089	0.04126	1.2238	30	1.79E-05
0.0345	4.08887	287.7982	0.04107	1.2238	30	1.79E-05
0.0365	4.10969	287.8099	0.04149	1.2238	30	1.79E-05
0.0385	4.17338	287.8005	0.04279	1.2238	30	1.79E-05
0.04	4.18401	287.7931	0.043	1.2239	30	1.79E-05
0.0425	4.19261	287.788	0.04318	1.2239	30	1.79E-05
0.045	4.25697	287.7841	0.04452	1.2239	30	1.79E-05
0.047	4.3272	287.7853	0.046	1.2239	30	1.79E-05
0.0485	4.35073	287.7962	0.0465	1.2239	30	1.79E-05
0.05	4.32366	287.7939	0.04592	1.2239	30	1.79E-05
0.0555	4.38892	287.7982	0.04732	1.2238	30	1.79E-05
0.06	4.41891	287.807	0.04797	1.2238	30	1.79E-05
0.066	4.42261	287.8046	0.04805	1.2238	30	1.79E-05
0.0705	4.47395	287.7923	0.04917	1.2239	30	1.79E-05
0.076	4.54811	287.8089	0.05081	1.2238	30	1.79E-05
0.0805	4.51407	287.8017	0.05006	1.2238	30	1.79E-05
0.086	4.54312	287.7962	0.0507	1.2239	30	1.79E-05
0.0905	4.59885	287.8146	0.05195	1.2238	30	1.79E-05
0.0955	4.61663	287.8118	0.05235	1.2238	30	1.79E-05
0.1	4.70118	287.8058	0.05429	1.2238	30	1.79E-05
0.11	4.72157	287.8025	0.05476	1.2238	30	1.79E-05
0.12	4.77513	287.8015	0.05601	1.2238	30	1.79E-05
0.13	4.88567	287.812	0.05863	1.2238	30	1.79E-05
0.14	4.88781	287.8177	0.05868	1.2238	30	1.79E-05
0.15	4.99307	287.8374	0.06123	1.2237	30	1.79E-05
0.16	5.03374	287.8185	0.06224	1.2237	30	1.79E-05
0.1705	4.98142	287.8216	0.06095	1.2237	30	1.79E-05
0.1805	5.15422	287.838	0.06525	1.2237	30	1.79E-05
0.19	5.20661	287.8507	0.06658	1.2236	30	1.79E-05
0.2	5.29017	287.8544	0.06873	1.2236	30	1.79E-05
0.226	5.41215	287.8569	0.07194	1.2236	30	1.79E-05
0.25	5.59218	287.853	0.07681	1.2236	30	1.79E-05

0.2755	5.68079	287.8509	0.07926	1.2236	30	1.79E-05
0.3	5.94843	287.8431	0.08691	1.2236	30	1.79E-05
0.326	6.02585	287.8579	0.08918	1.2236	30	1.79E-05
0.35	6.23936	287.8431	0.09562	1.2236	30	1.79E-05
0.3755	6.35984	287.8468	0.09934	1.2236	30	1.79E-05
0.4	6.48827	287.8562	0.10339	1.2236	30	1.79E-05
0.4255	6.65953	287.8542	0.10892	1.2236	30	1.79E-05
0.45	6.80223	287.8534	0.11364	1.2236	30	1.79E-05
0.475	6.91179	287.8446	0.11733	1.2236	30	1.79E-05
0.4995	7.01285	287.8548	0.12079	1.2236	30	1.79E-05
0.5255	7.18612	287.8468	0.12683	1.2236	30	1.79E-05
0.5495	7.22506	287.8521	0.12821	1.2236	30	1.79E-05
0.575	7.34011	287.853	0.13232	1.2236	30	1.79E-05
0.5995	7.46294	287.8591	0.13679	1.2236	30	1.79E-05
0.6495	7.62692	287.856	0.14286	1.2236	30	1.79E-05
0.6995	7.89475	287.8581	0.15307	1.2236	30	1.79E-05
0.7495	8.04823	287.8499	0.15909	1.2236	30	1.79E-05
0.799	8.23989	287.8749	0.16674	1.2235	30	1.79E-05
0.849	8.43711	287.8999	0.1748	1.2234	30	1.79E-05
0.899	8.59144	287.8581	0.18128	1.2236	30	1.79E-05
0.949	8.7843	287.8536	0.18952	1.2236	30	1.79E-05
0.9985	8.90147	287.8653	0.1946	1.2235	30	1.79E-05
1.049	9.10799	287.8472	0.20374	1.2236	30	1.79E-05
1.0985	9.28593	287.8546	0.21178	1.2236	30	1.79E-05
1.1485	9.41028	287.8548	0.21749	1.2236	30	1.79E-05
1.1985	9.54978	287.8694	0.22397	1.2235	30	1.79E-05
1.273	9.73888	287.8501	0.23295	1.2236	30	1.79E-05
1.348	9.96439	287.8829	0.24383	1.2234	30	1.79E-05
1.423	10.10933	287.8817	0.25097	1.2235	30	1.79E-05
1.4975	10.22796	287.8831	0.2569	1.2234	30	1.79E-05
1.5725	10.40096	287.8886	0.26566	1.2234	30	1.79E-05
1.6475	10.55288	287.9087	0.27345	1.2233	30	1.79E-05
1.722	10.66609	287.8378	0.27943	1.2237	30	1.79E-05
1.797	10.70751	287.8288	0.28161	1.2237	30	1.79E-05
1.8715	10.79289	287.7763	0.28618	1.2239	30	1.79E-05
1.947	10.88515	287.7595	0.29111	1.224	30	1.79E-05
2.021	10.92973	287.7267	0.29353	1.2242	30	1.79E-05
2.096	11.00748	287.7292	0.29772	1.2242	30	1.79E-05
2.1705	11.00986	287.7257	0.29786	1.2242	30	1.79E-05
2.246	11.07139	287.721	0.3012	1.2242	30	1.79E-05
2.32	11.10381	287.7513	0.30293	1.2241	30	1.79E-05
2.395	11.13139	287.7324	0.30446	1.2241	30	1.79E-05
2.4695	11.14306	287.7187	0.30511	1.2242	30	1.79E-05
2.545	11.16576	287.7	0.30638	1.2243	30	1.79E-05
2.6195	11.16228	287.6974	0.30619	1.2243	30	1.79E-05
2.6945	11.16484	287.691	0.30634	1.2243	30	1.79E-05
2.769	11.18067	287.7257	0.30717	1.2242	30	1.79E-05
2.844	11.19389	287.7125	0.30791	1.2242	30	1.79E-05
2.9185	11.18852	287.7193	0.30761	1.2242	30	1.79E-05
2.9935	11.18476	287.7121	0.30741	1.2242	30	1.79E-05
3.093	11.19177	287.7183	0.30779	1.2242	30	1.79E-05
3.193	11.2054	287.7197	0.30854	1.2242	30	1.79E-05
3.2925	11.19851	287.7064	0.30817	1.2243	30	1.79E-05
3.392	11.21491	287.7001	0.30908	1.2243	30	1.79E-05
3.492	11.22942	287.7107	0.30987	1.2242	30	1.79E-05
3.5915	11.2232	287.7091	0.30953	1.2243	30	1.79E-05
3.6915	11.22342	287.6884	0.30957	1.2244	30	1.79E-05
3.7915	11.23552	287.7031	0.31022	1.2243	30	1.79E-05

10/3/00	11:02 AM	LEC				
Rel Humidi	77					
y (cm)	Vmean (m	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.001	2.52958	288.4765	0.01568	1.2207	30	1.80E-05
0.0025	2.57612	288.481	0.01626	1.2207	30	1.80E-05
0.003	2.57277	288.4505	0.01622	1.2208	30	1.80E-05
0.004	2.57028	288.4765	0.01619	1.2207	30	1.80E-05
0.005	2.59705	288.4769	0.01653	1.2207	30	1.80E-05
0.0055	2.60385	288.4987	0.01661	1.2206	30	1.80E-05
0.0065	2.61332	288.5126	0.01673	1.2205	30	1.80E-05
0.0075	2.66164	288.4874	0.01736	1.2206	30	1.80E-05
0.0085	2.71402	288.4913	0.01805	1.2206	30	1.80E-05
0.0095	2.73262	288.4964	0.01829	1.2206	30	1.80E-05
0.011	2.75557	288.4907	0.0186	1.2206	30	1.80E-05
0.012	2.76825	288.4936	0.01878	1.2206	30	1.80E-05
0.013	2.84562	288.4808	0.01984	1.2207	30	1.80E-05
0.0135	2.88396	288.4901	0.02038	1.2206	30	1.80E-05
0.0145	2.95332	288.4689	0.02137	1.2207	30	1.80E-05
0.0155	3.04151	288.4854	0.02267	1.2206	30	1.80E-05
0.0175	3.21183	288.4856	0.02528	1.2206	30	1.80E-05
0.02	3.3972	288.4821	0.02828	1.2207	30	1.80E-05
0.0225	3.59883	288.4892	0.03173	1.2206	30	1.80E-05
0.024	3.80651	288.4821	0.0355	1.2207	30	1.80E-05
0.0255	4.07104	288.5108	0.0406	1.2205	30	1.80E-05
0.0275	4.3051	288.5141	0.04541	1.2205	30	1.80E-05
0.03	4.56076	288.4954	0.05096	1.2206	30	1.80E-05
0.032	4.77015	288.503	0.05575	1.2206	30	1.80E-05
0.034	5.01267	288.5272	0.06155	1.2205	30	1.80E-05
0.0355	5.26987	288.5368	0.06803	1.2204	30	1.80E-05
0.0375	5.46929	288.5145	0.07328	1.2205	30	1.80E-05
0.04	5.6002	288.5344	0.07683	1.2204	30	1.80E-05
0.0425	5.77878	288.5487	0.0818	1.2204	30	1.80E-05
0.044	5.94941	288.5225	0.08671	1.2205	30	1.80E-05
0.0455	6.0774	288.5258	0.09048	1.2205	30	1.80E-05
0.0475	6.15564	288.526	0.09283	1.2205	30	1.80E-05
0.0495	6.26386	288.5202	0.09612	1.2205	30	1.80E-05
0.055	6.44033	288.5483	0.1016	1.2204	30	1.80E-05
0.0605	6.62508	288.5614	0.10751	1.2203	30	1.80E-05
0.065	6.78469	288.5553	0.11275	1.2203	30	1.80E-05
0.07	6.84152	288.5541	0.11465	1.2203	30	1.80E-05
0.075	6.96801	288.5534	0.11893	1.2203	30	1.80E-05
0.08	6.99937	288.5576	0.12	1.2203	30	1.80E-05
0.085	7.10566	288.544	0.12368	1.2204	30	1.80E-05
0.09	7.18782	288.5641	0.12655	1.2203	30	1.80E-05
0.0945	7.24863	288.5375	0.12871	1.2204	30	1.80E-05
0.1	7.32449	288.5414	0.13142	1.2204	30	1.80E-05
0.1095	7.42679	288.5692	0.1351	1.2203	30	1.80E-05
0.12	7.48553	288.5262	0.13727	1.2205	30	1.80E-05
0.1295	7.57692	288.569	0.14062	1.2203	30	1.80E-05
0.14	7.64186	288.5532	0.14305	1.2203	30	1.80E-05
0.1495	7.72644	288.543	0.14623	1.2204	30	1.80E-05
0.1595	7.78285	288.5366	0.14838	1.2204	30	1.80E-05
0.1695	7.83218	288.5397	0.15027	1.2204	30	1.80E-05
0.1795	7.8878	288.5547	0.1524	1.2203	30	1.80E-05
0.1895	7.94303	288.5686	0.15453	1.2203	30	1.80E-05
0.1995	7.99983	288.5413	0.15677	1.2204	30	1.80E-05
0.2245	8.14707	288.5606	0.16258	1.2203	30	1.80E-05
0.249	8.20678	288.5561	0.16497	1.2203	30	1.80E-05

0.274	8.26964	288.5707	0.1675	1.2203	30	1.80E-05
0.299	8.39732	288.5526	0.17273	1.2203	30	1.80E-05
0.324	8.46235	288.5614	0.17541	1.2203	30	1.80E-05
0.3485	8.54695	288.5563	0.17893	1.2203	30	1.80E-05
0.374	8.64001	288.5516	0.18285	1.2203	30	1.80E-05
0.3985	8.70947	288.575	0.18579	1.2202	30	1.80E-05
0.4235	8.80767	288.5733	0.19	1.2202	30	1.80E-05
0.448	8.88642	288.5826	0.19341	1.2202	30	1.80E-05
0.4735	8.93877	288.5787	0.1957	1.2202	30	1.80E-05
0.498	9.01641	288.5916	0.1991	1.2202	30	1.80E-05
0.5235	9.06591	288.5926	0.2013	1.2202	30	1.80E-05
0.5475	9.12073	288.5951	0.20373	1.2201	30	1.80E-05
0.573	9.13196	288.5982	0.20423	1.2201	30	1.80E-05
0.5975	9.27105	288.5933	0.21051	1.2201	30	1.80E-05
0.6475	9.39385	288.6115	0.21611	1.2201	30	1.80E-05
0.6975	9.49122	288.6398	0.22059	1.2199	30	1.80E-05
0.747	9.57111	288.6074	0.22434	1.2201	30	1.80E-05
0.797	9.66325	288.6084	0.22868	1.2201	30	1.80E-05
0.847	9.76452	288.5918	0.23351	1.2202	30	1.80E-05
0.8965	9.87827	288.5953	0.23898	1.2201	30	1.80E-05
0.9465	9.97195	288.6029	0.24353	1.2201	30	1.80E-05
0.9965	10.04454	288.6054	0.24709	1.2201	30	1.80E-05
1.0465	10.17653	288.614	0.25361	1.2201	30	1.80E-05
1.096	10.23711	288.569	0.25669	1.2203	30	1.80E-05
1.146	10.29736	288.5867	0.2597	1.2202	30	1.80E-05
1.196	10.35992	288.5799	0.26287	1.2202	30	1.80E-05
1.271	10.49807	288.5653	0.26994	1.2203	30	1.80E-05
1.3455	10.6007	288.5896	0.27522	1.2202	30	1.80E-05
1.4205	10.64266	288.5694	0.27743	1.2203	30	1.80E-05
1.4945	10.74593	288.5555	0.28285	1.2203	30	1.80E-05
1.5695	10.80582	288.553	0.28602	1.2203	30	1.80E-05
1.6445	10.86766	288.5573	0.28929	1.2203	30	1.80E-05
1.719	10.90865	288.5654	0.29147	1.2203	30	1.80E-05
1.794	10.97347	288.5553	0.29496	1.2203	30	1.80E-05
1.8685	10.98771	288.5455	0.29573	1.2204	30	1.80E-05
1.9435	11.03183	288.5469	0.29811	1.2204	30	1.80E-05
2.018	11.05738	288.5284	0.29952	1.2204	30	1.80E-05
2.093	11.08198	288.5491	0.30083	1.2204	30	1.80E-05
2.167	11.09911	288.5054	0.30181	1.2206	30	1.80E-05
2.2425	11.11249	288.5176	0.30252	1.2205	30	1.80E-05
2.3165	11.10752	288.5348	0.30223	1.2204	30	1.80E-05
2.3915	11.11746	288.5426	0.30276	1.2204	30	1.80E-05
2.466	11.12137	288.5534	0.30296	1.2203	30	1.80E-05
2.5415	11.12128	288.5475	0.30297	1.2204	30	1.80E-05
2.6155	11.11695	288.5266	0.30275	1.2205	30	1.80E-05
2.6905	11.11747	288.5397	0.30277	1.2204	30	1.80E-05
2.765	11.10679	288.5656	0.30216	1.2203	30	1.80E-05
2.8405	11.11721	288.5358	0.30276	1.2204	30	1.80E-05
2.915	11.10226	288.5477	0.30193	1.2204	30	1.80E-05
2.99	11.1026	288.5455	0.30195	1.2204	30	1.80E-05
3.09	11.10033	288.551	0.30182	1.2203	30	1.80E-05
3.19	11.09481	288.5374	0.30154	1.2204	30	1.80E-05
3.29	11.10007	288.5473	0.30181	1.2204	30	1.80E-05
3.39	11.09687	288.5766	0.3016	1.2202	30	1.80E-05
3.49	11.08716	288.5852	0.30107	1.2202	30	1.80E-05
3.5895	11.08681	288.5992	0.30103	1.2201	30	1.80E-05
3.6895	11.08278	288.609	0.3008	1.2201	30	1.80E-05
3.79	11.0789	288.6035	0.3006	1.2201	30	1.80E-05

10/3/00	10:03 AM	TEC				
Rel Humidi	77					
y (cm)	Vmean (m/s)	T (degK)	DP ("H2O)	density (kg/m ³)	Patm ("Hg)	viscosity (kg/ms)
0	2.97136	287.7597	0.02169	1.224	30	1.79E-05
0.001	3.02869	287.7066	0.02254	1.2243	30	1.79E-05
0.0015	3.07156	287.7167	0.02318	1.2242	30	1.79E-05
0.0025	3.18641	287.7201	0.02495	1.2242	30	1.79E-05
0.0035	3.30277	287.7365	0.0268	1.2241	30	1.79E-05
0.0045	3.33224	287.7628	0.02728	1.224	30	1.79E-05
0.006	3.40773	287.7497	0.02853	1.2241	30	1.79E-05
0.007	3.46753	287.7867	0.02954	1.2239	30	1.79E-05
0.008	3.50169	287.7654	0.03013	1.224	30	1.79E-05
0.009	3.47721	287.7849	0.0297	1.2239	30	1.79E-05
0.0095	3.57412	287.7671	0.03138	1.224	30	1.79E-05
0.0105	3.58146	287.7884	0.03151	1.2239	30	1.79E-05
0.0115	3.63358	287.7736	0.03244	1.224	30	1.79E-05
0.0125	3.66973	287.7468	0.03309	1.2241	30	1.79E-05
0.0135	3.70273	287.7615	0.03368	1.224	30	1.79E-05
0.015	3.78341	287.7804	0.03517	1.2239	30	1.79E-05
0.0175	3.79435	287.7597	0.03537	1.224	30	1.79E-05
0.019	3.81201	287.771	0.0357	1.224	30	1.79E-05
0.0205	3.86861	287.7779	0.03677	1.2239	30	1.79E-05
0.0225	3.92531	287.7927	0.03785	1.2239	30	1.79E-05
0.0245	3.95439	287.7757	0.03842	1.2239	30	1.79E-05
0.027	3.98836	287.8031	0.03908	1.2238	30	1.79E-05
0.029	4.05859	287.8103	0.04046	1.2238	30	1.79E-05
0.0305	4.08297	287.8431	0.04095	1.2236	30	1.79E-05
0.0325	4.14298	287.8702	0.04215	1.2235	30	1.79E-05
0.035	4.12233	287.9255	0.04173	1.2233	30	1.79E-05
0.0375	4.17758	287.9509	0.04285	1.2231	30	1.79E-05
0.039	4.16163	287.987	0.04251	1.223	30	1.79E-05
0.0405	4.25045	287.9794	0.04435	1.223	30	1.79E-05
0.0425	4.16968	288.0102	0.04268	1.2229	30	1.79E-05
0.0445	4.26056	288.0161	0.04455	1.2228	30	1.79E-05
0.047	4.22958	288.0282	0.04391	1.2228	30	1.79E-05
0.049	4.2367	288.045	0.04405	1.2227	30	1.79E-05
0.054	4.32612	288.0373	0.04593	1.2227	30	1.79E-05
0.059	4.3518	288.0532	0.04648	1.2227	30	1.79E-05
0.0635	4.3864	288.0475	0.04722	1.2227	30	1.79E-05
0.069	4.47822	288.0641	0.04921	1.2226	30	1.79E-05
0.074	4.45149	288.0668	0.04863	1.2226	30	1.79E-05
0.079	4.46683	288.053	0.04897	1.2227	30	1.79E-05
0.0835	4.51372	288.0696	0.05	1.2226	30	1.79E-05
0.089	4.51034	288.0803	0.04992	1.2225	30	1.79E-05
0.094	4.56127	288.0451	0.05106	1.2227	30	1.79E-05
0.099	4.59478	288.0502	0.05181	1.2227	30	1.79E-05
0.109	4.6991	288.0377	0.05419	1.2227	30	1.79E-05
0.119	4.77265	288.0645	0.0559	1.2226	30	1.79E-05
0.129	4.80986	288.0684	0.05677	1.2226	30	1.79E-05
0.139	4.8713	288.0789	0.05823	1.2225	30	1.79E-05
0.149	4.95996	288.101	0.06036	1.2224	30	1.79E-05
0.159	4.98886	288.0818	0.06107	1.2225	30	1.79E-05
0.169	5.07864	288.0512	0.0633	1.2227	30	1.79E-05
0.179	5.13255	288.0873	0.06464	1.2225	30	1.79E-05
0.189	5.19523	288.0914	0.06623	1.2225	30	1.79E-05
0.199	5.28698	288.1127	0.06858	1.2224	30	1.79E-05
0.2235	5.55201	288.1225	0.07563	1.2223	30	1.80E-05
0.249	5.68712	288.1217	0.07935	1.2223	30	1.80E-05

0.2735	5.87904	288.1068	0.08481	1.2224	30	1.79E-05
0.299	6.01373	288.1238	0.08873	1.2223	30	1.80E-05
0.3235	6.14036	288.1143	0.09251	1.2224	30	1.79E-05
0.349	6.37466	288.1433	0.09969	1.2222	30	1.80E-05
0.3735	6.4887	288.1474	0.10329	1.2222	30	1.80E-05
0.399	6.63351	288.1582	0.10795	1.2222	30	1.80E-05
0.4235	6.72402	288.1449	0.11092	1.2222	30	1.80E-05
0.449	6.80638	288.1607	0.11365	1.2222	30	1.80E-05
0.4735	7.00316	288.1431	0.12032	1.2222	30	1.80E-05
0.499	7.10968	288.1668	0.124	1.2221	30	1.80E-05
0.5235	7.14701	288.1236	0.12532	1.2223	30	1.80E-05
0.5485	7.27641	288.1709	0.12988	1.2221	30	1.80E-05
0.5735	7.31093	288.1837	0.13111	1.2221	30	1.80E-05
0.599	7.46218	288.1726	0.1366	1.2221	30	1.80E-05
0.6485	7.66818	288.1711	0.14424	1.2221	30	1.80E-05
0.6985	7.82981	288.166	0.15039	1.2221	30	1.80E-05
0.7485	8.02539	288.1687	0.15799	1.2221	30	1.80E-05
0.7985	8.19164	288.1344	0.16463	1.2223	30	1.80E-05
0.848	8.28508	288.1576	0.16839	1.2222	30	1.80E-05
0.8985	8.55039	288.1404	0.17936	1.2223	30	1.80E-05
0.948	8.69086	288.147	0.1853	1.2222	30	1.80E-05
0.998	8.8644	288.1654	0.19276	1.2221	30	1.80E-05
1.048	9.0042	288.1629	0.19889	1.2221	30	1.80E-05
1.098	9.20083	288.1433	0.20769	1.2222	30	1.80E-05
1.1475	9.33227	288.1513	0.21366	1.2222	30	1.80E-05
1.1975	9.50094	288.1755	0.22143	1.2221	30	1.80E-05
1.2715	9.68166	288.1732	0.22993	1.2221	30	1.80E-05
1.347	9.80419	288.1654	0.2358	1.2221	30	1.80E-05
1.4215	10.00361	288.1832	0.24547	1.2221	30	1.80E-05
1.497	10.13557	288.1627	0.25201	1.2221	30	1.80E-05
1.571	10.30114	288.1793	0.26029	1.2221	30	1.80E-05
1.646	10.43084	288.183	0.26689	1.2221	30	1.80E-05
1.721	10.5716	288.1644	0.27416	1.2221	30	1.80E-05
1.796	10.60667	288.1802	0.27596	1.2221	30	1.80E-05
1.8705	10.70125	288.1726	0.28091	1.2221	30	1.80E-05
1.9455	10.76447	288.189	0.28422	1.222	30	1.80E-05
2.02	10.83807	288.1744	0.28814	1.2221	30	1.80E-05
2.095	10.88328	288.1955	0.29053	1.222	30	1.80E-05
2.17	10.95893	288.1978	0.29458	1.222	30	1.80E-05
2.2445	10.99194	288.1828	0.29637	1.2221	30	1.80E-05
2.3195	11.04798	288.1757	0.29941	1.2221	30	1.80E-05
2.3945	11.04965	288.1995	0.29947	1.222	30	1.80E-05
2.469	11.08298	288.1904	0.30129	1.222	30	1.80E-05
2.5435	11.09513	288.2007	0.30194	1.222	30	1.80E-05
2.619	11.11266	288.1962	0.3029	1.222	30	1.80E-05
2.6935	11.12398	288.2165	0.3035	1.2219	30	1.80E-05
2.7685	11.13367	288.1814	0.30406	1.2221	30	1.80E-05
2.8425	11.14878	288.2238	0.30484	1.2219	30	1.80E-05
2.918	11.14446	288.2444	0.30458	1.2218	30	1.80E-05
2.992	11.14457	288.238	0.30459	1.2218	30	1.80E-05
3.092	11.14974	288.2362	0.30488	1.2218	30	1.80E-05
3.1915	11.15483	288.2089	0.30519	1.2219	30	1.80E-05
3.2915	11.1599	288.2101	0.30547	1.2219	30	1.80E-05
3.3915	11.15802	288.2159	0.30536	1.2219	30	1.80E-05
3.491	11.15995	288.2511	0.30542	1.2217	30	1.80E-05
3.591	11.15643	288.2522	0.30523	1.2217	30	1.80E-05
3.6905	11.16422	288.261	0.30564	1.2217	30	1.80E-05
3.7905	11.16238	288.2679	0.30553	1.2217	30	1.80E-05

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Rel Humidi	77					
y (cm)	Vmean (m	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.0015	3.86067	288.4882	0.03652	1.2206	30	1.80E-05
0.0025	3.92126	288.4833	0.03767	1.2207	30	1.80E-05
0.0035	4.02479	288.5005	0.03969	1.2206	30	1.80E-05
0.0045	4.08897	288.4972	0.04096	1.2206	30	1.80E-05
0.0055	4.15884	288.4833	0.04238	1.2207	30	1.80E-05
0.006	4.23262	288.4936	0.04389	1.2206	30	1.80E-05
0.007	4.32834	288.4862	0.0459	1.2206	30	1.80E-05
0.008	4.39582	288.4823	0.04734	1.2207	30	1.80E-05
0.009	4.51359	288.4952	0.04991	1.2206	30	1.80E-05
0.0105	4.63483	288.4958	0.05263	1.2206	30	1.80E-05
0.0115	4.70666	288.5143	0.05427	1.2205	30	1.80E-05
0.013	4.83258	288.5014	0.05722	1.2206	30	1.80E-05
0.014	4.88599	288.4997	0.05849	1.2206	30	1.80E-05
0.0145	5.04761	288.4888	0.06242	1.2206	30	1.80E-05
0.0155	5.12099	288.4954	0.06425	1.2206	30	1.80E-05
0.016	5.26499	288.4987	0.06791	1.2206	30	1.80E-05
0.018	5.43233	288.4718	0.07231	1.2207	30	1.80E-05
0.02	5.58982	288.4698	0.07656	1.2207	30	1.80E-05
0.0225	5.75652	288.4593	0.0812	1.2208	30	1.80E-05
0.0245	5.9491	288.4734	0.08672	1.2207	30	1.80E-05
0.026	6.06771	288.4509	0.09022	1.2208	30	1.80E-05
0.028	6.14355	288.4441	0.09249	1.2208	30	1.80E-05
0.0305	6.30035	288.4735	0.09726	1.2207	30	1.80E-05
0.033	6.4276	288.4458	0.10124	1.2208	30	1.80E-05
0.0345	6.43895	288.464	0.10159	1.2207	30	1.80E-05
0.036	6.57629	288.4583	0.10597	1.2208	30	1.80E-05
0.038	6.61275	288.4552	0.10715	1.2208	30	1.80E-05
0.04	6.67119	288.4509	0.10906	1.2208	30	1.80E-05
0.0425	6.7083	288.4513	0.11027	1.2208	30	1.80E-05
0.0445	6.81634	288.4398	0.11386	1.2209	30	1.80E-05
0.046	6.82969	288.4648	0.11429	1.2207	30	1.80E-05
0.048	6.85691	288.4374	0.11522	1.2209	30	1.80E-05
0.0505	6.94457	288.4468	0.11818	1.2208	30	1.80E-05
0.0555	7.02854	288.4484	0.12105	1.2208	30	1.80E-05
0.0605	7.12899	288.4554	0.12454	1.2208	30	1.80E-05
0.0655	7.14951	288.4357	0.12526	1.2209	30	1.80E-05
0.0705	7.26691	288.4603	0.1294	1.2208	30	1.80E-05
0.0755	7.27354	288.4693	0.12963	1.2207	30	1.80E-05
0.0805	7.36797	288.4691	0.13302	1.2207	30	1.80E-05
0.0855	7.3648	288.4527	0.13291	1.2208	30	1.80E-05
0.0905	7.48618	288.4673	0.13732	1.2207	30	1.80E-05
0.0955	7.49926	288.47	0.1378	1.2207	30	1.80E-05
0.1	7.54306	288.4468	0.13943	1.2208	30	1.80E-05
0.1105	7.62093	288.4689	0.14231	1.2207	30	1.80E-05
0.12	7.65364	288.4345	0.14355	1.2209	30	1.80E-05
0.1305	7.77197	288.4445	0.14802	1.2208	30	1.80E-05
0.14	7.86292	288.4648	0.15149	1.2207	30	1.80E-05
0.1505	7.89197	288.4815	0.1526	1.2207	30	1.80E-05
0.1605	7.96163	288.4665	0.15532	1.2207	30	1.80E-05
0.1705	7.97921	288.4665	0.15601	1.2207	30	1.80E-05
0.18	8.07821	288.4837	0.15989	1.2207	30	1.80E-05
0.1905	8.1397	288.4962	0.16233	1.2206	30	1.80E-05
0.2	8.14746	288.4888	0.16264	1.2206	30	1.80E-05
0.225	8.2719	288.4964	0.16764	1.2206	30	1.80E-05
0.2505	8.3749	288.4876	0.17185	1.2206	30	1.80E-05

0.2755	8.45729	288.4829	0.17525	1.2207	30	1.80E-05
0.3	8.55207	288.4831	0.1792	1.2207	30	1.80E-05
0.325	8.65293	288.4944	0.18344	1.2206	30	1.80E-05
0.35	8.74055	288.4954	0.18718	1.2206	30	1.80E-05
0.375	8.8059	288.4954	0.18998	1.2206	30	1.80E-05
0.3995	8.85812	288.4825	0.19225	1.2207	30	1.80E-05
0.4245	8.94823	288.4878	0.19618	1.2206	30	1.80E-05
0.4495	9.04399	288.5165	0.20038	1.2205	30	1.80E-05
0.475	9.10072	288.518	0.2029	1.2205	30	1.80E-05
0.499	9.19154	288.5114	0.20698	1.2205	30	1.80E-05
0.5245	9.24127	288.4794	0.20925	1.2207	30	1.80E-05
0.549	9.30059	288.4478	0.21197	1.2208	30	1.80E-05
0.5745	9.36316	288.4088	0.21486	1.221	30	1.80E-05
0.599	9.43712	288.3826	0.21829	1.2211	30	1.80E-05
0.649	9.54622	288.3514	0.22339	1.2213	30	1.80E-05
0.6985	9.65109	288.2973	0.22838	1.2215	30	1.80E-05
0.7485	9.79087	288.2733	0.23506	1.2216	30	1.80E-05
0.7985	9.9058	288.2823	0.2406	1.2216	30	1.80E-05
0.8485	9.99431	288.2804	0.24492	1.2216	30	1.80E-05
0.898	10.12672	288.2458	0.25149	1.2218	30	1.80E-05
0.948	10.22275	288.2189	0.25631	1.2219	30	1.80E-05
0.9975	10.30801	288.2286	0.26059	1.2218	30	1.80E-05
1.0475	10.41011	288.2243	0.26578	1.2219	30	1.80E-05
1.0975	10.51531	288.2113	0.2712	1.2219	30	1.80E-05
1.147	10.61131	288.2154	0.27617	1.2219	30	1.80E-05
1.197	10.69312	288.2282	0.28043	1.2218	30	1.80E-05
1.2725	10.80985	288.2392	0.28657	1.2218	30	1.80E-05
1.3465	10.91167	288.2187	0.29202	1.2219	30	1.80E-05
1.4215	11.00506	288.2259	0.29703	1.2219	30	1.80E-05
1.496	11.07677	288.2341	0.3009	1.2218	30	1.80E-05
1.5715	11.14586	288.1878	0.30472	1.222	30	1.80E-05
1.646	11.19062	288.2054	0.30716	1.2219	30	1.80E-05
1.7205	11.22844	288.1863	0.30926	1.222	30	1.80E-05
1.7955	11.24394	288.2036	0.31009	1.222	30	1.80E-05
1.87	11.25383	288.1984	0.31064	1.222	30	1.80E-05
1.945	11.2636	288.2109	0.31117	1.2219	30	1.80E-05
2.019	11.27141	288.1855	0.31163	1.222	30	1.80E-05
2.0945	11.27778	288.1812	0.31199	1.2221	30	1.80E-05
2.169	11.26267	288.1841	0.31115	1.222	30	1.80E-05
2.244	11.2655	288.1724	0.31132	1.2221	30	1.80E-05
2.3185	11.26373	288.1671	0.31123	1.2221	30	1.80E-05
2.394	11.27774	288.1617	0.31201	1.2222	30	1.80E-05
2.468	11.27716	288.1634	0.31197	1.2221	30	1.80E-05
2.5435	11.27939	288.1621	0.3121	1.2222	30	1.80E-05
2.6175	11.28262	288.1886	0.31225	1.222	30	1.80E-05
2.6935	11.2849	288.181	0.31238	1.2221	30	1.80E-05
2.7675	11.28466	288.1742	0.31238	1.2221	30	1.80E-05
2.8425	11.27607	288.1835	0.31189	1.2221	30	1.80E-05
2.917	11.28657	288.2001	0.31245	1.222	30	1.80E-05
2.992	11.28186	288.1851	0.31221	1.222	30	1.80E-05
3.0915	11.27546	288.1779	0.31186	1.2221	30	1.80E-05
3.191	11.27429	288.1759	0.3118	1.2221	30	1.80E-05
3.291	11.2685	288.1974	0.31145	1.222	30	1.80E-05
3.3905	11.26321	288.1673	0.3112	1.2221	30	1.80E-05
3.4905	11.27039	288.1861	0.31157	1.222	30	1.80E-05
3.59	11.26253	288.1791	0.31115	1.2221	30	1.80E-05
3.69	11.27352	288.1847	0.31175	1.222	30	1.80E-05
3.79	11.26273	288.181	0.31116	1.2221	30	1.80E-05

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Rel Humidi 77

y (cm)	Vmean (m	T (degK)	DP ("H2O)	density (kg	Patm ("Hg)	viscosity (kg/ms)
0.0005	3.23724	288.271	0.0257	1.2216	30	1.80E-05
0.0015	3.23361	288.2374	0.02564	1.2218	30	1.80E-05
0.002	3.22532	288.164	0.02552	1.2221	30	1.80E-05
0.003	3.19313	288.1187	0.02502	1.2224	30	1.80E-05
0.004	3.26186	288.1168	0.02611	1.2224	30	1.79E-05
0.0055	3.32464	288.077	0.02712	1.2225	30	1.79E-05
0.0065	3.33134	288.0524	0.02724	1.2227	30	1.79E-05
0.0075	3.43093	288.0576	0.02889	1.2226	30	1.79E-05
0.0085	3.48818	288.0307	0.02986	1.2228	30	1.79E-05
0.0095	3.52829	288.0455	0.03055	1.2227	30	1.79E-05
0.0105	3.57512	288.0219	0.03137	1.2228	30	1.79E-05
0.011	3.69471	288.0325	0.0335	1.2228	30	1.79E-05
0.012	3.71045	288.0315	0.03379	1.2228	30	1.79E-05
0.013	3.7513	288.0422	0.03454	1.2227	30	1.79E-05
0.0145	3.79174	288.0266	0.03529	1.2228	30	1.79E-05
0.0155	3.83025	288.0252	0.03601	1.2228	30	1.79E-05
0.018	3.91515	288.02	0.03762	1.2228	30	1.79E-05
0.0195	3.99713	288.0247	0.03921	1.2228	30	1.79E-05
0.0215	4.03732	288.0067	0.04001	1.2229	30	1.79E-05
0.023	4.11405	288.0412	0.04154	1.2227	30	1.79E-05
0.0255	4.20203	288.0206	0.04334	1.2228	30	1.79E-05
0.0275	4.18693	288.0098	0.04303	1.2229	30	1.79E-05
0.0295	4.29216	288.0186	0.04522	1.2228	30	1.79E-05
0.031	4.31006	288.0327	0.04559	1.2228	30	1.79E-05
0.033	4.37963	288.0274	0.04708	1.2228	30	1.79E-05
0.0355	4.43382	288.02	0.04825	1.2228	30	1.79E-05
0.038	4.43111	288.0165	0.04819	1.2228	30	1.79E-05
0.0395	4.52246	288.0444	0.0502	1.2227	30	1.79E-05
0.0415	4.49997	288.0354	0.0497	1.2227	30	1.79E-05
0.043	4.48416	288.0026	0.04936	1.2229	30	1.79E-05
0.0455	4.58326	287.9936	0.05156	1.2229	30	1.79E-05
0.0475	4.54899	288.0032	0.05079	1.2229	30	1.79E-05
0.0495	4.605	288.0137	0.05205	1.2228	30	1.79E-05
0.0545	4.61816	288.0028	0.05235	1.2229	30	1.79E-05
0.0595	4.69419	288.0366	0.05408	1.2227	30	1.79E-05
0.064	4.73632	287.9991	0.05506	1.2229	30	1.79E-05
0.0695	4.85936	288.0241	0.05796	1.2228	30	1.79E-05
0.0745	4.87152	288.0129	0.05825	1.2228	30	1.79E-05
0.08	4.89886	288.0395	0.0589	1.2227	30	1.79E-05
0.0845	4.93701	288.0217	0.05982	1.2228	30	1.79E-05
0.0895	4.97483	288.0256	0.06074	1.2228	30	1.79E-05
0.0945	4.9997	288.009	0.06136	1.2229	30	1.79E-05
0.1	5.06737	288.0264	0.06302	1.2228	30	1.79E-05
0.1095	5.08327	288.0106	0.06342	1.2229	30	1.79E-05
0.12	5.20588	288.0276	0.06652	1.2228	30	1.79E-05
0.1295	5.20848	288.0213	0.06658	1.2228	30	1.79E-05
0.1395	5.27253	288.0465	0.06823	1.2227	30	1.79E-05
0.1495	5.32279	288.0282	0.06954	1.2228	30	1.79E-05
0.1595	5.37695	288.0045	0.07097	1.2229	30	1.79E-05
0.1695	5.40793	288.0338	0.07178	1.2227	30	1.79E-05
0.18	5.50761	288.02	0.07445	1.2228	30	1.79E-05
0.1895	5.52834	288.0065	0.07502	1.2229	30	1.79E-05
0.2	5.61774	288.0094	0.07746	1.2229	30	1.79E-05
0.224	5.73553	287.9895	0.08075	1.223	30	1.79E-05
0.2495	5.81033	287.9921	0.08287	1.2229	30	1.79E-05

0.2745	6.03887	288.0034	0.08951	1.2229	30	1.79E-05
0.2995	6.15797	288.0295	0.09307	1.2228	30	1.79E-05
0.324	6.26078	288.0071	0.09621	1.2229	30	1.79E-05
0.3495	6.41576	288.01	0.10103	1.2229	30	1.79E-05
0.3745	6.54297	288.0166	0.10508	1.2228	30	1.79E-05
0.3995	6.63473	288.0182	0.10805	1.2228	30	1.79E-05
0.424	6.77301	288.01	0.1126	1.2229	30	1.79E-05
0.4495	6.93395	288.0096	0.11801	1.2229	30	1.79E-05
0.474	6.99809	288.0307	0.1202	1.2228	30	1.79E-05
0.4995	7.1668	287.9983	0.12608	1.2229	30	1.79E-05
0.524	7.21592	288.0131	0.12781	1.2228	30	1.79E-05
0.5495	7.32312	288.0213	0.13163	1.2228	30	1.79E-05
0.5745	7.46906	288.0219	0.13693	1.2228	30	1.79E-05
0.5995	7.53797	288.0075	0.13947	1.2229	30	1.79E-05
0.6495	7.73755	288.028	0.14694	1.2228	30	1.79E-05
0.6995	7.89221	288.0084	0.15289	1.2229	30	1.79E-05
0.7495	8.14454	288.0034	0.16282	1.2229	30	1.79E-05
0.7995	8.35571	288.0112	0.17137	1.2229	30	1.79E-05
0.8495	8.48751	288.02	0.17681	1.2228	30	1.79E-05
0.8995	8.6519	287.9995	0.18374	1.2229	30	1.79E-05
0.949	8.87389	288.0161	0.19328	1.2228	30	1.79E-05
0.9995	9.08225	288.033	0.20245	1.2228	30	1.79E-05
1.049	9.2	288.0338	0.20773	1.2227	30	1.79E-05
1.099	9.35588	288.0442	0.21483	1.2227	30	1.79E-05
1.149	9.53528	288.0651	0.22313	1.2226	30	1.79E-05
1.199	9.66597	288.0492	0.2293	1.2227	30	1.79E-05
1.273	9.87562	288.0965	0.23931	1.2225	30	1.79E-05
1.3485	10.04244	288.1228	0.24744	1.2223	30	1.80E-05
1.4225	10.24628	288.1363	0.25757	1.2223	30	1.80E-05
1.4985	10.40157	288.1716	0.2654	1.2221	30	1.80E-05
1.5725	10.55584	288.2351	0.27327	1.2218	30	1.80E-05
1.6475	10.67267	288.2643	0.27932	1.2217	30	1.80E-05
1.722	10.79839	288.3151	0.28588	1.2214	30	1.80E-05
1.7975	10.89283	288.3336	0.29088	1.2214	30	1.80E-05
1.8715	10.9777	288.3204	0.29545	1.2214	30	1.80E-05
1.947	11.05232	288.3393	0.29946	1.2213	30	1.80E-05
2.0215	11.10147	288.3409	0.30213	1.2213	30	1.80E-05
2.097	11.13446	288.3369	0.30393	1.2213	30	1.80E-05
2.171	11.19489	288.3479	0.30722	1.2213	30	1.80E-05
2.2465	11.22389	288.3412	0.30882	1.2213	30	1.80E-05
2.321	11.24264	288.3494	0.30985	1.2213	30	1.80E-05
2.3965	11.25815	288.3688	0.31068	1.2212	30	1.80E-05
2.471	11.26725	288.3274	0.31123	1.2214	30	1.80E-05
2.546	11.28015	288.3473	0.31192	1.2213	30	1.80E-05
2.6205	11.28417	288.3131	0.31218	1.2214	30	1.80E-05
2.696	11.28824	288.3533	0.31236	1.2213	30	1.80E-05
2.7705	11.29623	288.3528	0.31281	1.2213	30	1.80E-05
2.8455	11.2924	288.3149	0.31264	1.2214	30	1.80E-05
2.9205	11.29267	288.3145	0.31265	1.2214	30	1.80E-05
2.995	11.29711	288.3114	0.3129	1.2215	30	1.80E-05
3.095	11.30222	288.3295	0.31316	1.2214	30	1.80E-05
3.195	11.30269	288.3338	0.31319	1.2214	30	1.80E-05
3.2945	11.29436	288.3223	0.31274	1.2214	30	1.80E-05
3.3945	11.29994	288.3424	0.31302	1.2213	30	1.80E-05
3.4945	11.28882	288.3473	0.3124	1.2213	30	1.80E-05
3.594	11.30076	288.3494	0.31306	1.2213	30	1.80E-05
3.694	11.30317	288.3492	0.31319	1.2213	30	1.80E-05
3.7935	11.29992	288.3551	0.31301	1.2213	30	1.80E-05

Representative Leading Edge Values				delta99 =	2.166
Cf =	0.008422			Uinf =	11.0844
				U* =	0.719291
y	u	y/delta99	u/Uinf	y+	u+
0	4.33361	0	0.390965	0.00E+00	6.024833
0.0005	4.34992	0.000231	0.392436	2.44E-01	6.047508
0.001	4.4515	0.000462	0.4016	4.88E-01	6.18873
0.002	4.49282	0.000923	0.405328	9.76E-01	6.246176
0.0025	4.62541	0.001154	0.41729	1.22E+00	6.43051
0.0035	4.67593	0.001616	0.421848	1.71E+00	6.500746
0.0045	4.74223	0.002078	0.427829	2.20E+00	6.59292
0.006	4.85313	0.00277	0.437834	2.93E+00	6.747099
0.007	4.9326	0.003232	0.445004	3.41E+00	6.857583
0.008	5.05924	0.003693	0.456429	3.90E+00	7.033645
0.0085	5.097	0.003924	0.459835	4.15E+00	7.086142
0.0095	5.17516	0.004386	0.466887	4.63E+00	7.194804
0.0105	5.26279	0.004848	0.474793	5.12E+00	7.316632
0.011	5.35285	0.005078	0.482917	5.37E+00	7.441839
0.012	5.4209	0.00554	0.489057	5.85E+00	7.536446
0.013	5.47353	0.006002	0.493805	6.34E+00	7.609615
0.0155	5.56286	0.007156	0.501864	7.56E+00	7.733807
0.0175	5.81217	0.008079	0.524356	8.54E+00	8.080412
0.0195	5.88581	0.009003	0.530999	9.51E+00	8.18279
0.021	6.00705	0.009695	0.541937	1.02E+01	8.351345
0.0235	6.07286	0.010849	0.547874	1.15E+01	8.442838
0.026	6.12464	0.012004	0.552546	1.27E+01	8.514826
0.028	6.2058	0.012927	0.559868	1.37E+01	8.627659
0.0295	6.30615	0.01362	0.568921	1.44E+01	8.767171
0.031	6.37663	0.014312	0.57528	1.51E+01	8.865157
0.033	6.43834	0.015235	0.580847	1.61E+01	8.950949
0.0355	6.50155	0.01639	0.58655	1.73E+01	9.038827
0.0375	6.54839	0.017313	0.590775	1.83E+01	9.103947
0.0395	6.63423	0.018236	0.59852	1.93E+01	9.223287
0.0415	6.7058	0.01916	0.604976	2.02E+01	9.322788
0.0435	6.72409	0.020083	0.606626	2.12E+01	9.348215
0.046	6.79398	0.021237	0.612932	2.24E+01	9.44538
0.048	6.79794	0.022161	0.613289	2.34E+01	9.450886
0.0525	6.91116	0.024238	0.623503	2.56E+01	9.608291
0.058	6.98826	0.026777	0.630459	2.83E+01	9.71548
0.0625	7.06765	0.028855	0.637621	3.05E+01	9.825852
0.068	7.07685	0.031394	0.638451	3.32E+01	9.838642
0.0725	7.15889	0.033472	0.645853	3.54E+01	9.952699
0.0775	7.20418	0.03578	0.649939	3.78E+01	10.01566
0.0825	7.22876	0.038089	0.652156	4.02E+01	10.04984
0.088	7.31839	0.040628	0.660242	4.29E+01	10.17445
0.092	7.31859	0.042475	0.66026	4.49E+01	10.17472
0.0975	7.40567	0.045014	0.668116	4.76E+01	10.29579
0.108	7.47906	0.049861	0.674737	5.27E+01	10.39782
0.1175	7.55954	0.054247	0.681998	5.73E+01	10.50971
0.128	7.61239	0.059095	0.686766	6.24E+01	10.58318
0.1375	7.67038	0.063481	0.691998	6.71E+01	10.6638

0.148	7.74673	0.068329	0.698886	7.22E+01	10.76995
0.1575	7.75619	0.072715	0.699739	7.68E+01	10.7831
0.1675	7.81873	0.077331	0.705381	8.17E+01	10.87005
0.1775	7.84869	0.081948	0.708084	8.66E+01	10.9117
0.1875	7.92488	0.086565	0.714958	9.15E+01	11.01762
0.1975	7.95641	0.091182	0.717802	9.63E+01	11.06146
0.2215	8.08727	0.102262	0.729608	1.08E+02	11.24339
0.2475	8.13968	0.114266	0.734337	1.21E+02	11.31625
0.2715	8.24138	0.125346	0.743512	1.32E+02	11.45764
0.297	8.30937	0.137119	0.749645	1.45E+02	11.55216
0.3215	8.37028	0.14843	0.755141	1.57E+02	11.63684
0.347	8.4932	0.160203	0.76623	1.69E+02	11.80773
0.371	8.57211	0.171283	0.773349	1.81E+02	11.91744
0.3965	8.64031	0.183056	0.779502	1.93E+02	12.01225
0.421	8.69404	0.194367	0.784349	2.05E+02	12.08695
0.447	8.74218	0.206371	0.788692	2.18E+02	12.15388
0.471	8.83258	0.217452	0.796848	2.30E+02	12.27956
0.496	8.89896	0.228994	0.802836	2.42E+02	12.37184
0.5205	8.97747	0.240305	0.809919	2.54E+02	12.48099
0.5465	9.05349	0.252308	0.816778	2.67E+02	12.58668
0.5705	9.10884	0.263389	0.821771	2.78E+02	12.66363
0.596	9.14332	0.275162	0.824882	2.91E+02	12.71157
0.646	9.25669	0.298246	0.83511	3.15E+02	12.86918
0.6955	9.39408	0.321099	0.847505	3.39E+02	13.06019
0.746	9.50489	0.344414	0.857502	3.64E+02	13.21424
0.795	9.60136	0.367036	0.866205	3.88E+02	13.34836
0.8455	9.69265	0.390351	0.874441	4.12E+02	13.47528
0.8945	9.80788	0.412973	0.884836	4.36E+02	13.63548
0.945	9.90845	0.436288	0.893909	4.61E+02	13.7753
0.9945	9.99622	0.459141	0.901828	4.85E+02	13.89732
1.0445	10.11734	0.482225	0.912755	5.10E+02	14.06571
1.094	10.18353	0.505078	0.918726	5.34E+02	14.15773
1.1445	10.26109	0.528393	0.925724	5.58E+02	14.26556
1.194	10.32959	0.551247	0.931903	5.82E+02	14.36079
1.269	10.47013	0.585873	0.944582	6.19E+02	14.55617
1.3435	10.56652	0.620268	0.953278	6.55E+02	14.69018
1.418	10.66085	0.654663	0.961789	6.92E+02	14.82132
1.4925	10.74977	0.689058	0.969811	7.28E+02	14.94495
1.568	10.8028	0.723915	0.974595	7.65E+02	15.01867
1.642	10.86024	0.758079	0.979777	8.01E+02	15.09853
1.7175	10.90031	0.792936	0.983392	8.38E+02	15.15424
1.7915	10.95653	0.827101	0.988464	8.74E+02	15.2324
1.867	10.99064	0.861958	0.991541	9.11E+02	15.27982

Representative Trailing Edge Values				delta99 =	2.844		
				Uinf =	11.2081	U* =	0.727318
y	u	y/delta99	u/Uinf	y+	u+	Rex =	7.65E+05
						Avg Cf =	0.008844
0.001	3.03065	0.000352	0.270398	4.97E-01	4.166882		
0.0025	3.06423	0.000879	0.273394	1.24E+00	4.213051		
0.0035	3.16747	0.001231	0.282605	1.74E+00	4.354997		
0.005	3.1951	0.001758	0.285071	2.48E+00	4.392986		
0.006	3.22159	0.00211	0.287434	2.98E+00	4.429408		
0.007	3.19467	0.002461	0.285032	3.48E+00	4.392395		
0.0075	3.32252	0.002637	0.296439	3.72E+00	4.568178		
0.0085	3.35327	0.002989	0.299183	4.22E+00	4.610456		
0.0095	3.36752	0.00334	0.300454	4.72E+00	4.630049		
0.01	3.40364	0.003516	0.303677	4.97E+00	4.679711		
0.011	3.51677	0.003868	0.31377	5.46E+00	4.835255		
0.012	3.51197	0.004219	0.313342	5.96E+00	4.828655		
0.0135	3.55826	0.004747	0.317472	6.70E+00	4.8923		
0.0145	3.59868	0.005098	0.321079	7.20E+00	4.947874		
0.0155	3.65778	0.00545	0.326351	7.70E+00	5.029131		
0.0165	3.62207	0.005802	0.323165	8.19E+00	4.980033		
0.0185	3.72357	0.006505	0.332221	9.19E+00	5.119587		
0.02	3.83922	0.007032	0.34254	9.93E+00	5.278595		
0.0225	3.88435	0.007911	0.346566	1.12E+01	5.340645		
0.025	3.90574	0.00879	0.348475	1.24E+01	5.370055		
0.027	3.9503	0.009494	0.35245	1.34E+01	5.431321		
0.0285	4.01266	0.010021	0.358014	1.42E+01	5.51706		
0.03	4.03647	0.010549	0.360139	1.49E+01	5.549797		
0.032	4.09861	0.011252	0.365683	1.59E+01	5.635234		
0.0345	4.08887	0.012131	0.364814	1.71E+01	5.621843		
0.0365	4.10969	0.012834	0.366671	1.81E+01	5.650468		
0.0385	4.17338	0.013537	0.372354	1.91E+01	5.738037		
0.04	4.18401	0.014065	0.373302	1.99E+01	5.752652		
0.0425	4.19261	0.014944	0.37407	2.11E+01	5.764476		
0.045	4.25697	0.015823	0.379812	2.23E+01	5.852966		
0.047	4.3272	0.016526	0.386078	2.33E+01	5.949526		
0.0485	4.35073	0.017053	0.388177	2.41E+01	5.981877		
0.05	4.32366	0.017581	0.385762	2.48E+01	5.944659		
0.0555	4.38892	0.019515	0.391585	2.76E+01	6.034385		
0.06	4.41891	0.021097	0.39426	2.98E+01	6.075619		
0.066	4.42261	0.023207	0.394591	3.28E+01	6.080706		
0.0705	4.47395	0.024789	0.399171	3.50E+01	6.151294		
0.076	4.54811	0.026723	0.405788	3.77E+01	6.253258		
0.0805	4.51407	0.028305	0.402751	4.00E+01	6.206456		
0.086	4.54312	0.030239	0.405343	4.27E+01	6.246397		
0.0905	4.59885	0.031821	0.410315	4.49E+01	6.323021		
0.0955	4.61663	0.033579	0.411901	4.74E+01	6.347467		
0.1	4.70118	0.035162	0.419445	4.97E+01	6.463716		
0.11	4.72157	0.038678	0.421264	5.46E+01	6.49175		
0.12	4.77513	0.042194	0.426043	5.96E+01	6.565391		
0.13	4.88567	0.04571	0.435905	6.46E+01	6.717374		
0.14	4.88781	0.049226	0.436096	6.95E+01	6.720316		

0.15	4.99307	0.052743	0.445488	7.45E+01	6.865039
0.16	5.03374	0.056259	0.449116	7.95E+01	6.920957
0.1705	4.98142	0.059951	0.444448	8.47E+01	6.849022
0.1805	5.15422	0.063467	0.459866	8.96E+01	7.086607
0.19	5.20661	0.066807	0.46454	9.44E+01	7.158638
0.2	5.29017	0.070323	0.471995	9.93E+01	7.273526
0.226	5.41215	0.079466	0.482878	1.12E+02	7.441238
0.25	5.59218	0.087904	0.498941	1.24E+02	7.688764
0.2755	5.68079	0.096871	0.506847	1.37E+02	7.810595
0.3	5.94843	0.105485	0.530726	1.49E+02	8.178577
0.326	6.02585	0.114627	0.537633	1.62E+02	8.285023
0.35	6.23936	0.123066	0.556683	1.74E+02	8.57858
0.3755	6.35984	0.132032	0.567432	1.86E+02	8.74423
0.4	6.48827	0.140647	0.578891	1.99E+02	8.92081
0.4255	6.65953	0.149613	0.594171	2.11E+02	9.156278
0.45	6.80223	0.158228	0.606903	2.23E+02	9.352478
0.475	6.91179	0.167018	0.616678	2.36E+02	9.503114
0.4995	7.01285	0.175633	0.625695	2.48E+02	9.642062
0.5255	7.18612	0.184775	0.641154	2.61E+02	9.880294
0.5495	7.22506	0.193214	0.644628	2.73E+02	9.933833
0.575	7.34011	0.20218	0.654893	2.86E+02	10.09202
0.5995	7.46294	0.210795	0.665852	2.98E+02	10.2609
0.6495	7.62692	0.228376	0.680483	3.23E+02	10.48636
0.6995	7.89475	0.245956	0.704379	3.47E+02	10.8546
0.7495	8.04823	0.263537	0.718073	3.72E+02	11.06562
0.799	8.23989	0.280942	0.735173	3.97E+02	11.32914
0.849	8.43711	0.298523	0.752769	4.22E+02	11.6003
0.899	8.59144	0.316104	0.766538	4.46E+02	11.81249
0.949	8.7843	0.333685	0.783746	4.71E+02	12.07765
0.9985	8.90147	0.35109	0.7942	4.96E+02	12.23875
1.049	9.10799	0.368847	0.812626	5.21E+02	12.5227
1.0985	9.28593	0.386252	0.828502	5.46E+02	12.76735
1.1485	9.41028	0.403833	0.839596	5.70E+02	12.93832
1.1985	9.54978	0.421414	0.852043	5.95E+02	13.13012
1.273	9.73888	0.447609	0.868914	6.32E+02	13.39012
1.348	9.96439	0.47398	0.889035	6.69E+02	13.70017
1.423	10.10933	0.500352	0.901966	7.07E+02	13.89945
1.4975	10.22796	0.526547	0.912551	7.44E+02	14.06256
1.5725	10.40096	0.552918	0.927986	7.81E+02	14.30042
1.6475	10.55288	0.57929	0.94154	8.18E+02	14.5093
1.722	10.66609	0.605485	0.951641	8.55E+02	14.66495
1.797	10.70751	0.631857	0.955337	8.92E+02	14.7219
1.8715	10.79289	0.658052	0.962954	9.29E+02	14.83929
1.947	10.88515	0.684599	0.971186	9.67E+02	14.96614
2.021	10.92973	0.710619	0.975163	1.00E+03	15.02743
2.096	11.00748	0.73699	0.9821	1.04E+03	15.13433
2.1705	11.00986	0.763186	0.982313	1.08E+03	15.13761
2.246	11.07139	0.789733	0.987803	1.12E+03	15.2222
2.32	11.10381	0.815752	0.990695	1.15E+03	15.26678

APPENDIX F

Infrared Camera Heat Transfer Data

Flat Panels, 1 Blower 06 Feb 01

Time sync with freestream temps				IR data, Tamb = 73		IR data, Tamb = 144		Power		1 Comparison		Adjusted Temps	
Time	TC time	Tfs panel	Tcmiddle	Time	IR Temp	Time	IR Temp			from AGEMA		Time	IR Temp
0	0	73.282	72.155	0	71.8358	0	66.2018	71.8358		71.5		0	71.8358
1	1.187	73.255	72.152	1	71.8592	1	66.2288	71.86088				1	71.82783
2.170999	2.32	73.322	72.112	2.170999	71.843	2.170999	66.2108	71.84051				2.170999	71.77491
3.331	3.532	73.294	72.148	3.331	71.8664	3.331	66.2342	71.86565				3.331	71.76192
4.671	4.725	73.287	72.151	4.671	71.8628	4.671	66.2324	71.86249				4.671	71.71629
5.37		73.3		5.37	71.834	5.37	66.2018	71.83288				5.37	71.66557
6.37	5.917	73.313	72.13	6.37	71.8142	6.37	66.1802	71.81227				6.37	71.6144
7.541	7.048	73.307	72.138	7.541	71.843	7.541	66.2108	71.84145				7.541	71.60647
8.71	8.179	73.27	72.156	8.71	71.8484	8.71	66.2162	71.84915				8.71	71.5752
9.411	9.313	73.26	72.18	9.411	71.8502	9.411	66.218	71.85157				9.411	71.55502
10.47	10.446	73.445	72.172	10.47	71.8232	10.47	66.191	71.81307				10.47	71.4948
11.21	11.651	82.558	72.185	11.21	71.8286	11.21	66.1964	71.25199		71		11.21	71.47699
12.24	12.798	92.73	72.148	12.24	71.9834	12.24	66.3566	70.77449				12.24	71.59948
13.39	13.933	101.135	72.128	13.39	73.0598	13.39	67.4798	71.32843				13.39	72.63981
14.541	15.08	108.238	72.158	14.541	74.201	14.541	68.6714	72.0281		71.6		14.541	73.74491
15.72	16.214	114.127	72.142	15.72	75.353	15.72	69.872	72.81403				15.72	74.85993
16.89	17.351	118.945	72.135	16.89	76.4654	16.89	71.0294	73.62694				16.89	75.93563
18.35	18.494	122.87	72.174	18.35	77.8244	18.35	72.4442	74.74196		74.1		18.35	77.24884
19.48	19.697	126.284	72.161	19.48	78.7982	19.48	73.4576	75.50354				19.48	78.1872
20.551	20.86	128.681	72.152	20.551	79.6568	20.551	74.3522	76.21314				20.551	79.0122
21.321		129.6385		21.321	80.2238	21.321	74.939	76.72062		76		21.321	79.55505
22.36	22.006	130.596	72.173	22.36	80.9942	22.36	75.7418	77.43151				22.36	80.29286
23.551	23.201	132.223	72.14	23.551	81.7844	23.551	76.5662	78.12057				23.551	81.04571
24.72	24.345	133.458	72.143	24.72	82.517	24.72	77.324	78.7764		78		24.72	81.74164
25.901	25.489	134.458	72.151	25.901	83.2082	25.901	78.0422	79.40544				25.901	82.3958
27.061	26.683	135.239	72.159	27.061	83.8652	27.061	78.7244	80.01389				27.061	83.01641
28.26	27.825	135.866	72.152	28.26	84.4646	28.26	79.3472	80.57432				28.26	83.57821
28.99	28.96	136.365	72.193	28.99	84.8228	28.99	79.7162	80.9015				28.99	83.91351
30.061	30.152	136.776	72.22	30.061	85.3196	30.061	80.2328	81.37275		80.6		30.061	84.37672
30.831	31.282	137.257	72.16	30.831	85.658	30.831	80.5838	81.68125				30.831	84.69096
32.161	32.415	137.531	72.17	32.161	86.2556	32.161	81.2048	82.26182				32.161	85.24685
33.301	33.55	137.801	72.209	33.301	86.6984	33.301	81.662	82.68784				33.301	85.65389
34.401	34.684	138.118	72.169	34.401	87.1016	34.401	82.0814	83.07133				34.401	86.02259
35.13		138.227		35.13	87.4004	35.13	82.391	83.36336				35.13	86.29852
36.171	35.887	138.336	72.239	36.171	87.7694	36.171	82.7744	83.72558				36.171	86.63487
37.38	37.048	138.576	72.195	37.38	88.1762	37.38	83.1956	84.11746				37.38	87.00375
38.571	38.186	138.859	72.259	38.571	88.6244	38.571	83.66	84.54807				38.571	87.41459
39.74	39.347	138.96	72.278	39.74	89.0114	39.74	84.0614	84.92879				39.74	87.76493
40.951	40.555	139.119	72.23	40.951	89.4002	40.951	84.4628	85.30771				40.951	88.11574
42.14	41.698	139.333	72.327	42.14	89.7656	42.14	84.8408	85.65981				42.14	88.44385
42.87	42.89	139.528	72.352	42.87	89.9924	42.87	85.0784	85.87448				42.87	88.64775
43.941	44.043	139.649	72.404	43.941	90.3038	43.941	85.4006	86.17836				43.941	88.92556
45.181	45.239	139.762	72.461	45.181	90.6548	45.181	85.766	86.52234				45.181	89.23767
46.681	46.403	139.945	72.462	46.681	91.1192	46.681	86.243	86.97536				46.681	89.65502
47.84	47.612	140.087	72.447	47.84	91.427	47.84	86.5634	87.27434				47.84	89.92647
48.911	48.76	140.118	72.526	48.911	91.6808	48.911	86.8262	87.52621				48.911	90.14667
50.11	49.901	140.231	72.577	50.11	92.012	50.11	87.1682	87.85038				50.11	90.44027
51.331	51.042	140.232	72.604	51.331	92.2802	51.331	87.4454	88.11852				51.331	90.67017
52.551	52.189	140.231	72.623	52.551	92.6294	52.551	87.8072	88.46778				52.551	90.9811
53.75	53.333	140.366	72.683	53.75	92.9282	53.75	88.115	88.75819				53.75	91.24229
54.99	54.488	140.422	72.716	54.99	93.1604	54.99	88.358	88.98691				54.99	91.4356
	55.63	140.574	72.784					-4.18294				56.321	91.70705
56.321	56.773	140.724	72.828	56.321	93.4736	56.321	88.6802	89.28134				57.661	91.96382
57.661	57.906	140.865	72.901	57.661	93.7724	57.661	88.9916	89.57137				58.87	92.1977
58.87	59.049	141.004	72.953	58.87	94.0442	58.87	89.2724	89.83453				60.09	92.43484
60.09	60.191	141.132	73.03	60.09	94.3196	60.09	89.5568	90.10198				61.291	92.67797
61.291	61.373	141.301	73.091	61.291	94.6004	61.291	89.8466	90.37227				62.5	92.89025
62.5	62.51	141.364	73.116	62.5	94.8506	62.5	90.104	90.61856				63.23	93.00595
63.23	63.649	141.467	73.205	63.23	94.9892	63.23	90.248	90.75075				64.26	93.19144
64.26	64.788	141.543	73.266	64.26	95.207	64.26	90.4766	90.96383				65.5	93.38655
65.5	65.94	141.63	73.337	65.5	95.441	65.5	90.7178	91.19242				66.73	93.59697
66.73	67.084	141.662	73.401	66.73	95.693	66.73	90.9752	91.44243				67.98	93.81996
67.98	68.225	141.698	73.482	67.98	95.9522	67.98	91.2434	91.69939				69.201	93.99586
69.201	69.368	141.64	73.533	69.201	96.1664	69.201	91.4666	91.9172				70.771	94.22742
70.771	70.51	141.614	73.587	70.771	96.4472	70.771	91.7546	92.19962				71.87	94.41435
71.87	71.65	141.609	73.647	71.87	96.6686	71.87	91.985	92.42133				72.71	94.532
72.71	72.792	141.659	73.727	72.71	96.8126	72.71	92.1326	92.56222				73.85	94.67624
73.85	73.933	141.712	73.795	73.85	96.9926	73.85	92.318	92.73892				75.11	94.86892
75.11	75.076	141.837	73.848	75.11	97.2248	75.11	92.5592	92.96335				76.34	95.02834
76.34	76.218	141.932	73.995	76.34	97.4228	76.34	92.7608	93.15545				77.651	95.23202
77.651	77.35	141.974	74.035	77.651	97.6676	77.651	93.0146	93.39764				78.911	95.3887
78.911	78.51	142.125	74.129	78.911	97.8638	78.911	93.2198	93.58445				80.21	95.56036
80.21	79.659	142.226	74.215	80.21	98.0762	80.21	93.4394	93.79057				81.49	95.74881
81.49	80.791	142.276	74.296	81.49	98.3048	81.49	93.6752	94.01607				83.081	95.91851
	82.011	142.396	74.338					-4.29619				84.35	96.12351

83.081	83.154	142.499	74.454	83.081	98.5244	83.081	93.9002	94.2218	85.48	96.26266
84.35	84.295	142.613	74.507	84.35	98.7692	84.35	94.1522	94.45952	86.75	96.39743
85.48	85.429	142.748	74.594	85.48	98.9438	85.48	94.334	94.62573	88.051	96.56182
86.75	86.63	142.848	74.672	86.75	99.1184	86.75	94.514	94.79411	89.35	96.74068
88.051	87.762	142.963	74.774	88.051	99.3236	88.051	94.7264	94.99216	90.22	96.85559
89.35	88.893	143.153	74.842	89.35	99.5432	89.35	94.9532	95.19995	91.36	96.95663
90.22	90.025	143.207	74.98	90.22	99.6854	90.22	95.1008	95.33879	92.691	97.10028
91.36	91.157	143.232	75.023	91.36	99.8222	91.36	95.2412	95.47404	93.99	97.25934
92.691	92.287	143.235	75.168	92.691	100.0076	92.691	95.4338	95.65925	95.63	97.4671
93.99	93.486	143.216	75.24	93.99	100.2074	93.99	95.639	95.86023	96.86	97.58152
	94.617	143.207	75.345					-4.34661	98.031	97.66719
95.63	95.749	143.114	75.446	95.63	100.4666	95.63	95.9072	96.12577	99.36	97.83071
96.86	96.891	143.123	75.486	96.86	100.6196	96.86	96.0638	96.27822	100.661	97.9213
98.031	98.031	143.075	75.601	98.031	100.742	98.031	96.1898	96.4036	101.97	98.05484
99.36	99.161	143.062	75.72	99.36	100.9472	99.36	96.4022	96.60961	103.63	98.22957
100.661	100.298	143.048	75.811	100.661	101.0786	100.661	96.539	96.74523	104.87	98.32748
101.97	101.449	143.048	75.92	101.97	101.2532	101.97	96.7172	96.91648	106	98.41984
	102.6	143.06	75.989					-4.33747	107.34	98.49661
103.63	103.81	143.003	76.095	103.63	101.48	103.63	96.9512	97.14607	108.671	98.64386
104.87	104.949	143.081	76.22	104.87	101.6168	104.87	97.0916	97.27803	109.541	98.74977
106	106.093	143.219	76.3	106	101.7446	106	97.2248	97.39725	110.71	98.84631
107.34	107.226	143.185	76.372	107.34	101.8634	107.34	97.349	97.51816	112.34	98.96978
108.671	108.416	143.298	76.44	108.671	102.0524	108.671	97.5452	97.70014	113.51	99.06988
109.541	109.548	143.277	76.55	109.541	102.1856	109.541	97.6802	97.83464	114.38	99.15959
110.71	110.735	143.291	76.631	110.71	102.3188	110.71	97.8188	97.96697	115.561	99.22695
112.34	111.865	143.402	76.75	112.34	102.4934	112.34	97.9988	98.13467	116.86	99.33741
113.51	112.997	143.395	76.857	113.51	102.6302	113.51	98.141	98.27191	118.13	99.45057
114.38	114.128	143.361	76.995	114.38	102.7472	114.38	98.2598	98.39102	119.421	99.53788
115.561	115.317	143.362	77.092	115.561	102.8516	115.561	98.3696	98.49536	121.021	99.68749
116.86	116.448	143.317	77.164	116.86	103.0028	116.86	98.5262	98.64936	122.291	99.78086
	117.578	143.316	77.286					-4.35338	123.451	99.86508
118.13	118.77	143.379	77.378	118.13	103.1558	118.13	98.6828	98.7985	124.801	99.97933
119.421	119.911	143.417	77.435	119.421	103.2836	119.421	98.816	98.92394	126.071	100.0529
121.021	121.054	143.418	77.543	121.021	103.4834	121.021	99.0194	99.12368	127.37	100.1418
122.291	122.182	143.519	77.644	122.291	103.6166	122.291	99.1562	99.2506	128.661	100.2435
123.451	123.315	143.546	77.688	123.451	103.7372	123.451	99.2822	99.36952	130.291	100.3633
124.801	124.448	143.62	77.813	124.801	103.8938	124.801	99.4442	99.52152	131.531	100.4558
126.071	125.589	143.646	77.923	126.071	104.0072	126.071	99.5594	99.6333	132.73	100.528
	126.79	143.656	78.086					-4.37452	134.1	100.6039
127.37	127.931	143.791	78.083	127.37	104.1368	127.37	99.6926	99.75389	135.401	100.6891
128.661	129.072	143.814	78.218	128.661	104.279	128.661	99.8402	99.89466	137.071	100.8257
130.291	130.215	143.808	78.271	130.291	104.45	130.291	100.0148	100.066	138.301	100.9149
131.531	131.358	143.883	78.391	131.531	104.5814	131.531	100.1516	100.1928	139.47	101.0204
132.73	132.492	143.938	78.498	132.73	104.6912	132.73	100.265	100.2992	140.37	101.039
134.1	133.69	143.922	78.625	134.1	104.81	134.1	100.3874	100.4189		
135.401	134.891	143.95	78.709	135.401	104.936	135.401	100.5188	100.5432		
	136.023	143.934	78.79					-4.3918		
137.071	137.169	144.002	78.893	137.071	105.125	137.071	100.7132	100.729		
138.301	138.315	144.07	79.003	138.301	105.2528	138.301	100.8446	100.8525		
139.47	139.477	144.15	79.088	139.47	105.395	139.47	100.9922	100.9898		
140.37	140.616	144.111	79.149	140.37	105.4418	140.37	101.039	101.039		

										Pr =	0.777		
										St corr w/ Pr=0.777			
time	twall	q	h - Blow	Velocity	density	cp	Rex	St	Rex	100000	0.003174779	0.003496	
0	295.51	0	0	1.509	1.147	1017.781	89919.55	0	100000	0.003174779	0.003496		
1	295.53	13.54	23.81	1.467	1.147	1017.768	87456.76	0.013903	200000	0.002763806	0.003044		
2.17	295.52	-4.86	-8.57	1.457	1.147	1017.8	86815.98	0.0001	300000	0.002548527	0.002807		
3.33	295.53	12.42	21.39	1.551	1.147	1017.786	92451.24	0.011814	400000	0.002406033	0.00265		
4.67	295.53	3.66	6.35	1.702	1.147	1017.783	101455.1	0.003196	500000	0.002301015	0.002534		
5.37	295.51	-15.41	-26.23	1.547	1.147	1017.796	92179.2	0.0001	600000	0.002218622	0.002443		
6.37	295.5	-14.76	-24.57	1.587	1.147	1017.793	94556.98	0.0001	700000	0.002151265	0.002369		
7.54	295.52	8.1	13.63	1.669	1.147	1017.775	99463.36	0.006996	800000	0.002094573	0.002307		
8.71	295.52	5.09	8.76	0	1.147	1017.77	654627.1	0.0001	900000	0.002045809	0.002253		
9.41	295.52	4.29	7.57	10.99	1.147	1017.859	654627.1	0.00059	1000000	0.00200315	0.002206		
10.47	295.5	-17.67	-30.41	12.061	1.124	1022.928	694934.9	0.0001	1100000	0.001965328	0.002164		
11.21	295.22	-359.22	-388.19	12.279	1.097	1030.64	681375.1	0.0001	1200000	0.001931422	0.002127		
12.24	294.97	-387.88	-110.89	12.484	1.075	1039.22	671019.7	0.0001	1300000	0.001900749	0.002093		
13.39	295.25	78.52	9.34	12.616	1.055	1048.482	659569.1	0.000669	1400000	0.001872785	0.002062		
14.54	295.61	308.09	23.14	12.808	1.037	1057.859	653941.6	0.001647	1500000	0.001847121	0.002034		
15.72	296.01	487.45	28.01	12.926	1.023	1066.865	646966.4	0.001985					
16.89	296.43	632.74	30.56	12.958	1.014	1069.159	640359	0.002175					
18.35	297	819.55	34.33	13.005	1.008	1069.338	636360.1	0.002449					
19.48	297.39	877.99	34.09	12.982	1.004	1069.467	630868.6	0.002446					
20.55	297.75	944.49	34.77	12.975	1.001	1069.572	627067	0.002503					
21.32	298.01	991.43	35.46	12.947	0.998	1069.663	622817	0.002566					
22.36	298.37	1067.66	37.16	13.013	0.996	1069.732	623793.4	0.00268					
23.55	298.73	1079.8	36.69	12.999	0.995	1069.79	621377.2	0.002652					
24.72	299.06	1112.53	37.16	12.97	0.993	1069.835	618574.3	0.002697					
25.9	299.39	1137.17	37.55	12.986	0.992	1069.871	618254.8	0.002725					
27.06	299.7	1167.23	38.27	12.981	0.991	1069.9	617157.4	0.002781					
28.26	299.99	1168.59	38.16	12.978	0.991	1069.924	616295.6	0.002773					
28.99	300.16	1172.48	38.21	12.934	0.99	1069.952	613391	0.002789					
30.06	300.4	1184.35	38.57	12.908	0.989	1069.969	611645.8	0.002824					
30.83	300.56	1177.94	38.37	12.923	0.989	1069.984	611915.6	0.002806					
32.16	300.86	1212.09	39.49	12.922	0.988	1070.003	611319.5	0.002891					
33.3	301.08	1197.91	39.07	12.878	0.988	1070.016	608875.9	0.00287					
34.4	301.27	1190.55	38.89	12.915	0.988	1070.031	610207.7	0.002848					
35.13	301.42	1217.31	39.83	12.942	0.987	1070.047	610997.4	0.002914					
36.17	301.61	1207.93	39.57	12.882	0.987	1070.053	607953.8	0.002908					
37.38	301.81	1200.92	39.44	12.924	0.987	1070.063	609681.9	0.002889					
38.57	302.04	1227.46	40.42	12.846	0.986	1070.076	605652.1	0.002982					
39.74	302.23	1222.26	40.33	12.84	0.986	1070.087	605033.4	0.002977					
40.95	302.43	1221.55	40.47	12.957	0.986	1070.095	610319.7	0.00296					
42.14	302.61	1217.33	40.45	12.939	0.986	1070.102	609286.3	0.002963					
42.87	302.72	1218.18	40.52	12.94	0.985	1070.113	609046	0.002971					
43.94	302.88	1216.08	40.53	12.91	0.985	1070.121	607377.8	0.002978					
45.18	303.06	1215.54	40.65	12.928	0.985	1070.123	608162.3	0.002983					
46.68	303.29	1236.63	41.56	12.961	0.985	1070.13	609502	0.003042					
47.84	303.45	1221.1	41.12	13.012	0.985	1070.13	611929.9	0.002998					
48.91	303.58	1207.52	40.75	12.956	0.985	1070.13	609293.3	0.002984					
50.11	303.74	1224.63	41.53	12.975	0.985	1070.138	609942.4	0.003037					
51.33	303.88	1201.65	40.86	12.951	0.985	1070.141	608725.1	0.002993					
52.55	304.06	1236.78	42.32	12.979	0.984	1070.151	609757.5	0.003096					
53.75	304.21	1224.6	42.09	12.989	0.984	1070.16	610005.9	0.003077					
54.99	304.33	1190.56	40.99	12.921	0.984	1070.168	606576.9	0.003013					
56.32	304.49	1201.65	41.5	12.944	0.984	1070.177	607386.1	0.003045					
57.66	304.64	1200.87	41.55	12.941	0.983	1070.184	607034.7	0.003052					
58.87	304.77	1202.77	41.69	12.99	0.983	1070.195	609061.8	0.003051					
60.09	304.91	1205.91	41.88	12.967	0.983	1070.199	607848.8	0.00307					
61.29	305.05	1212.46	42.21	12.95	0.983	1070.205	606888.8	0.003098					
62.5	305.18	1204.39	41.97	12.93	0.983	1070.21	605833.2	0.003085					
63.23	305.25	1193.22	41.64	12.999	0.983	1070.215	608935.8	0.003045					
64.26	305.36	1201.98	42.05	13.006	0.983	1070.217	609165.2	0.003073					
65.5	305.48	1191.33	41.77	12.976	0.983	1070.219	607714.7	0.00306					
66.73	305.61	1200.2	42.2	13.004	0.983	1070.216	609144.5	0.003085					
67.98	305.74	1205.3	42.54	12.971	0.983	1070.214	607634.4	0.003117					
69.2	305.85	1192.71	42.23	12.978	0.983	1070.214	607961.9	0.003093					
70.77	306	1190.3	42.41	12.952	0.983	1070.217	606663.6	0.003112					
71.87	306.12	1202.31	43.03	12.985	0.983	1070.22	608105.9	0.00315					
72.71	306.19	1189.24	42.68	12.988	0.982	1070.228	608064.3	0.003127					
73.85	306.28	1177.31	42.36	12.962	0.982	1070.233	606658.9	0.00311					
75.11	306.4	1185.73	42.79	12.954	0.982	1070.236	606214.9	0.003143					
76.34	306.5	1174.34	42.42	12.953	0.982	1070.245	605936.5	0.003116					
77.65	306.63	1188.44	43.04	13.009	0.982	1070.251	608358.4	0.003148					
78.91	306.72	1170.74	42.49	12.936	0.982	1070.255	604883.5	0.003125					
80.21	306.83	1171.88	42.56	12.975	0.981	1070.262	606504.4	0.003124					
81.49	306.95	1182.1	43.04	12.893	0.981	1070.268	602463.2	0.003179					
83.08	307.06	1154.63	42.1	12.963	0.981	1070.275	605539.4	0.003093					
84.35	307.18	1183.08	43.23	12.866	0.981	1070.284	600785.1	0.0032					

85.48	307.27	1168.02	42.72	12.891	0.981	1070.29	601800.6	0.003156
86.75	307.35	1155.56	42.27	12.981	0.98	1070.297	605818.7	0.003105
88.05	307.46	1162.27	42.58	12.949	0.98	1070.309	603967.6	0.003135
89.35	307.57	1168.32	42.84	12.9	0.98	1070.312	601597.1	0.003166
90.22	307.64	1170.2	42.9	12.908	0.98	1070.314	601963.5	0.003169
91.36	307.71	1148.28	42.16	12.979	0.98	1070.314	605253.3	0.003097
92.69	307.81	1152.43	42.45	12.965	0.98	1070.313	604646.6	0.003122
93.99	307.91	1161.55	42.95	12.888	0.98	1070.312	601056.5	0.003177
95.63	308.05	1170.97	43.54	12.994	0.98	1070.306	606169.1	0.003195
96.86	308.13	1151.94	43.03	12.923	0.98	1070.307	602812.3	0.003174
98.03	308.19	1136.17	42.55	12.934	0.98	1070.304	603406.3	0.003136
99.36	308.3	1157.85	43.58	12.912	0.98	1070.303	602398	0.003218
100.66	308.37	1131.8	42.74	12.858	0.98	1070.299	599993.8	0.003169
101.97	308.46	1139.7	43.22	12.973	0.98	1070.302	605297.3	0.003176
103.63	308.58	1145.63	43.6	12.95	0.98	1070.303	604171.9	0.00321
104.87	308.65	1127.86	43.08	12.95	0.98	1070.299	604307.6	0.003172
106	308.71	1121.26	42.88	12.887	0.98	1070.304	601224.2	0.003172
107.34	308.78	1105.98	42.26	12.96	0.98	1070.313	604413.2	0.003109
108.67	308.87	1127.39	43.25	12.977	0.98	1070.311	605218	0.003177
109.54	308.94	1140.67	43.8	13.025	0.98	1070.318	607276.6	0.003206
110.71	309.01	1124.61	43.3	12.942	0.98	1070.317	603446.4	0.00319
112.34	309.1	1112.64	42.95	13.004	0.98	1070.317	606306.8	0.003149
113.51	309.17	1117	43.16	12.966	0.98	1070.324	604371.4	0.003173
114.38	309.23	1127.36	43.68	12.952	0.98	1070.324	603710.3	0.003215
115.56	309.29	1103.53	42.87	12.995	0.98	1070.322	605782.2	0.003145
116.86	309.37	1113.77	43.42	12.982	0.98	1070.322	605164.1	0.003189
118.13	309.45	1114.57	43.61	12.979	0.98	1070.319	605091.1	0.003203
119.42	309.51	1102.39	43.22	12.991	0.98	1070.319	605659.6	0.003172
121.02	309.62	1116.08	43.87	12.959	0.98	1070.323	604068.8	0.003227
122.29	309.68	1103.77	43.5	13.086	0.98	1070.325	609951.8	0.003169
123.45	309.75	1101.62	43.42	13.026	0.98	1070.325	607118.3	0.003178
124.8	309.83	1105.8	43.69	12.999	0.98	1070.332	605696.5	0.003204
126.07	309.88	1091.25	43.15	12.997	0.98	1070.333	605571.1	0.003165
127.37	309.95	1088.38	43.12	13.038	0.979	1070.338	607343.9	0.003156
128.66	310.02	1095.42	43.45	13.009	0.979	1070.339	605935.4	0.003187
130.29	310.97	1121.4	46.14	13	0.979	1070.34	605505.9	0.003387
131.53	311.04	1119.38	46.19	12.937	0.979	1070.349	602352.4	0.003407
132.73	311.1	1110.17	45.84	12.994	0.979	1070.35	604991.9	0.003367
134.1	311.17	1104.69	45.7	13.019	0.979	1070.349	606124.4	0.00335
135.4	311.24	1106.18	45.89	13.01	0.979	1070.354	605584.8	0.003366
137.07	311.34	1116.45	46.51	12.965	0.979	1070.358	603389.4	0.003423
138.3	311.41	1112.44	46.41	13.012	0.979	1070.357	605639.9	0.003404
139.47	311.49	1122.04	46.89	13.042	0.979	1070.358	606976.1	0.003431
140.37	311.52	1091.64	45.61	12.95	0.979	1070.357	602727.8	0.003361

Pitted Panels, 1 blower 08 Feb 01

Delta time	Tcmiddle	Tcpanel	Tcin	Uinf	rho	Cp	mu	Pr	Time	Re
0	75.169	76.145	-57798.2	1.223	1.153	1015.147	18.402	0.725	130.987	73016.87
0.99	75.093	76.071	76.98	1.392	1.153	1015.119	18.4	0.725	131.977	83109.45
2.091	75.09	76.134	77.202	0.481	1.153	1015.143	18.402	0.725	133.078	28701.54
3.098	75.176	76.19	77.193	0.653	1.153	1015.164	18.403	0.725	134.085	38966.9
4.152	75.161	76.213	77.272	0	1.153	1015.172	18.404	0.725	135.139	0
5.211	75.138	76.224	77.242	0	1.153	1015.176	18.404	0.725	136.198	0
6.214	75.168	76.205	77.254	0.311	1.153	1015.169	18.404	0.725	137.201	18549.93
7.267	75.142	76.266	77.282	1.075	1.153	1015.192	18.405	0.725	138.254	64163.34
8.325	75.163	76.233	77.254	0	1.153	1015.18	18.404	0.725	139.312	0
9.338	75.122	76.293	77.264	9.222	1.153	1015.202	18.406	0.725	140.325	550198.2
10.341	75.099	81.295	79.998	11.755	1.141	1017.237	18.536	0.727	141.328	689038
11.342	75.118	91.589	84.967	11.984	1.115	1022.544	18.801	0.732	142.329	677221.9
12.34	75.109	100.241	89.698	12.033	1.094	1028.54	19.02	0.737	143.327	659170.1
13.33	75.13	107.173	94.104	12.188	1.076	1034.674	19.191	0.744	144.317	650940.2
14.318	75.154	113.105	98.228	12.316	1.06	1041.081	19.335	0.75	145.305	643429.8
15.388	75.144	118.658	102.369	12.427	1.045	1048.222	19.465	0.757	146.375	635671.4
16.376	75.124	122.855	105.926	12.526	1.037	1050.273	19.564	0.759	147.363	632107
17.377	75.179	126.401	109.235	12.51	1.03	1050.452	19.649	0.758	148.364	624819.9
18.394	75.18	129.347	112.178	12.564	1.025	1050.606	19.718	0.758	149.381	622127.9
19.394	75.179	131.789	114.874	12.597	1.021	1050.737	19.776	0.757	150.381	619388.3
20.382	75.155	133.662	117.286	12.706	1.018	1050.84	19.82	0.757	151.369	621363.9
21.447	75.169	135.248	119.623	12.741	1.015	1050.928	19.858	0.757	152.434	620251.6
22.445	75.156	136.446	121.588	12.712	1.013	1050.996	19.886	0.757	153.432	616748
23.432	75.196	137.378	123.31	12.742	1.011	1051.049	19.908	0.756	154.419	616554.7
24.486	75.143	138.11	124.975	12.631	1.01	1051.091	19.925	0.756	155.473	609900.5
25.55	75.133	138.754	126.447	12.655	1.009	1051.128	19.94	0.756	156.537	609919.8
26.548	75.14	139.293	127.723	12.673	1.008	1051.16	19.953	0.756	157.535	609876.1
27.55	75.162	139.723	128.916	12.606	1.007	1051.185	19.963	0.756	158.537	605904.4
28.554	75.147	140.131	129.951	12.645	1.007	1051.209	19.973	0.756	159.541	607062.6
29.54	75.15	140.371	130.926	12.684	1.006	1051.223	19.978	0.756	160.527	608506.1
30.526	75.179	140.658	131.857	12.629	1.006	1051.24	19.985	0.756	161.513	605386.4
31.511	75.204	140.881	132.683	12.626	1.005	1051.253	19.99	0.756	162.498	604844.1
32.576	75.251	141.058	133.544	12.576	1.005	1051.264	19.994	0.756	163.563	602173.9
33.574	75.265	141.357	134.241	12.584	1.005	1051.281	20.001	0.756	164.561	602031.8
34.569	75.208	141.481	134.834	12.655	1.004	1051.289	20.004	0.756	165.556	605203.8
35.569	75.22	141.658	135.448	12.62	1.004	1051.299	20.008	0.756	166.556	603263.5
36.565	75.249	141.861	136.059	12.563	1.004	1051.311	20.013	0.756	167.552	600183.3
37.63	75.341	141.893	136.566	12.581	1.004	1051.313	20.014	0.756	168.617	600996.7
38.618	75.342	142.065	137.032	12.648	1.003	1051.324	20.018	0.756	169.605	603873.9
39.604	75.334	142.135	137.431	12.61	1.003	1051.328	20.02	0.756	170.591	601957.1
40.601	75.385	142.045	137.807	12.662	1.003	1051.322	20.018	0.756	171.588	604590.8
41.587	75.375	142.091	138.097	12.582	1.003	1051.325	20.019	0.756	172.574	600683.4
42.642	75.501	142.048	138.448	12.634	1.003	1051.323	20.018	0.756	173.629	603243.2
43.677	75.597	142.007	138.755	12.68	1.004	1051.32	20.017	0.756	174.664	605505.9
44.684	75.62	142.129	139.033	12.576	1.003	1051.327	20.019	0.756	175.671	600342.9
45.692	75.579	142.173	139.307	12.606	1.003	1051.33	20.021	0.756	176.679	601681.2
46.699	75.661	142.165	139.521	12.546	1.003	1051.33	20.02	0.756	177.686	598856
47.703	75.663	142.291	139.776	12.56	1.003	1051.337	20.023	0.756	178.69	599316.1
48.702	75.696	142.295	139.962	12.53	1.003	1051.337	20.023	0.756	179.689	597876
49.994	75.784	142.472	140.203	12.569	1.003	1051.348	20.028	0.756	180.981	599424.2
50.994	75.894	142.562	140.439	12.561	1.003	1051.353	20.03	0.756	181.981	598884.5
52.054	75.95	142.617	140.65	12.598	1.003	1051.357	20.031	0.756	183.041	600549.4
53.049	75.928	142.754	140.84	12.611	1.002	1051.365	20.034	0.756	184.036	600934.1
54.035	75.977	142.897	141.024	12.605	1.002	1051.374	20.037	0.756	185.022	600440.3
55.019	76.047	142.854	141.133	12.578	1.002	1051.371	20.036	0.756	186.006	599191.8
56.004	76.115	142.992	141.296	12.669	1.002	1051.379	20.04	0.756	186.991	603317.1
56.989	76.204	142.908	141.418	12.652	1.002	1051.374	20.038	0.756	187.976	602653.9
57.985	76.245	143.114	141.543	12.558	1.002	1051.387	20.043	0.756	188.972	597796.7
58.98	76.301	143.131	141.654	12.59	1.002	1051.388	20.043	0.756	189.967	599309.1
60.028	76.415	143.088	141.797	12.575	1.002	1051.385	20.042	0.756	191.015	598656.9
61.09	76.466	143.218	141.894	12.587	1.002	1051.393	20.045	0.756	192.077	599003.1
62.074	76.493	143.166	141.975	12.584	1.002	1051.39	20.044	0.756	193.061	598971.4

63.124	76.557	143.226	142.064	12.628	1.002	1051.393	20.045	0.756	194.111	600952.4
64.108	76.661	143.197	142.098	12.627	1.002	1051.392	20.044	0.756	195.095	600949.2
65.161	76.71	143.151	142.207	12.632	1.002	1051.389	20.043	0.756	196.148	601269.4
66.211	76.865	143.231	142.273	12.631	1.001	1051.394	20.045	0.756	197.198	601093.6
67.26	76.907	143.279	142.391	12.695	1.001	1051.397	20.046	0.756	198.247	604073.7
68.329	76.97	143.343	142.443	12.673	1.001	1051.401	20.048	0.755	199.316	602909.8
69.388	77.044	143.381	142.471	12.653	1.001	1051.403	20.049	0.755	200.375	601894.4
70.383	77.04	143.463	142.56	12.644	1.001	1051.408	20.051	0.755	201.37	601297.3
71.386	77.14	143.587	142.666	12.66	1.001	1051.415	20.054	0.755	202.373	601858.1
72.437	77.198	143.682	142.766	12.686	1.001	1051.421	20.056	0.755	203.424	602916.8
73.419	77.3	143.739	142.823	12.665	1.001	1051.425	20.057	0.755	204.406	601859.5
74.469	77.356	143.885	142.897	12.636	1	1051.433	20.061	0.755	205.456	600233.9
75.465	77.422	143.909	142.976	12.623	1	1051.435	20.061	0.755	206.452	599583.7
76.465	77.506	144.007	143.069	12.607	1	1051.441	20.063	0.755	207.452	598614.8
77.45	77.601	144.113	143.122	12.651	1	1051.447	20.066	0.755	208.437	600525
78.444	77.637	144.066	143.241	12.636	1	1051.445	20.065	0.755	209.431	599907.3
79.439	77.762	144.183	143.335	12.624	1	1051.452	20.068	0.755	210.426	599132.8
80.424	77.814	144.247	143.376	12.709	1	1051.456	20.069	0.755	211.411	603047.2
81.41	77.904	144.201	143.397	12.634	1	1051.453	20.068	0.755	212.397	599598.7
82.405	77.965	144.219	143.443	12.781	1	1051.454	20.068	0.755	213.392	606548.4
83.386	77.996	144.149	143.455	12.681	1	1051.45	20.067	0.755	214.373	601923.3
84.445	78.089	144.041	143.448	12.679	1	1051.443	20.064	0.755	215.432	601995.6
85.44	78.231	144.14	143.493	12.643	1	1051.449	20.067	0.755	216.427	600137.9
86.425	78.294	144.058	143.496	12.674	1	1051.444	20.065	0.755	217.412	601713.2
87.41	78.413	143.98	143.498	12.662	1	1051.439	20.063	0.755	218.397	601303.2
88.405	78.446	143.878	143.474	12.639	1	1051.433	20.06	0.755	219.392	600354.2
89.401	78.488	143.995	143.494	12.675	1	1051.44	20.063	0.755	220.388	601874.1
90.386	78.569	144.065	143.491	12.651	1	1051.444	20.065	0.755	221.373	600605.2
91.379	78.666	144.11	143.499	12.681	1	1051.447	20.066	0.755	222.366	601982.8
92.393	78.76	144.119	143.543	12.638	1	1051.448	20.066	0.755	223.38	599935.4
93.455	78.904	144.03	143.572	12.615	1	1051.442	20.064	0.755	224.442	598972.3
94.437	78.869	144.113	143.563	12.583	1	1051.447	20.066	0.755	225.424	597303
95.486	78.977	144.204	143.633	12.633	1	1051.453	20.068	0.755	226.473	599546.3
96.57	79.067	144.196	143.685	12.733	1	1051.452	20.068	0.755	227.557	604312.8
97.554	79.194	144.227	143.714	12.658	1	1051.454	20.069	0.755	228.541	600678.5
98.539	79.265	144.328	143.772	12.679	1	1051.461	20.071	0.755	229.526	601506.8
99.525	79.372	144.404	143.83	12.645	1	1051.465	20.073	0.755	230.512	599766.3
100.512	79.433	144.463	143.839	12.638	0.999	1051.469	20.074	0.755	231.499	599329.8
101.508	79.494	144.458	143.933	12.617	0.999	1051.469	20.074	0.755	232.495	598361.3
102.493	79.642	144.568	143.963	12.631	0.999	1051.475	20.077	0.755	233.48	598840.6
103.551	79.692	144.598	143.973	12.633	0.999	1051.477	20.077	0.755	234.538	598890.1
104.545	79.732	144.557	143.997	12.663	0.999	1051.475	20.076	0.755	235.532	600379.6
105.541	79.876	144.568	144.03	12.658	0.999	1051.475	20.077	0.755	236.528	600087.9
106.538	79.974	144.603	144.054	12.668	0.999	1051.477	20.077	0.755	237.525	600517.2
107.532	79.99	144.569	144.054	12.642	0.999	1051.475	20.077	0.755	238.519	599326.4
108.516	80.082	144.524	144.014	12.63	0.999	1051.473	20.076	0.755	239.503	598860.7

time adjustment								
1 second								
IR data				TC time	IR Temp, ϵ	IR Temp, ϵ	IR Temp a	Poly fit
IR time	ltimeadj	IRT, amb=77	IRT, amb=144					
6	7	74.8022	69.5624	0	74.8	69.56	74.8	74.93947
7.17	8.17	74.8346	69.5966	0.99	74.8	69.56	74.80446	74.94358
8.309	9.309	74.849	69.611	2.09	74.8	69.56	74.80066	74.94008
9.77	10.77	76.2152	71.033	3.1	74.8	69.56	74.79729	74.93697
10.87	11.87	77.4392	72.3074	4.15	74.8	69.56	74.7959	74.93569
11.91	12.91	78.6236	73.5404	5.21	74.8	69.56	74.79524	74.93508
13.109	14.109	79.9178	74.8868	6.21	74.8	69.56	74.79638	74.93614
14.309	15.309	81.1184	76.136	7.27	74.81	69.57	74.80271	74.94196
15.51	16.51	82.2992	77.3636	8.32	74.84	69.6	74.8347	74.97144
17.05	18.05	83.6762	78.791	9.34	74.88	69.64	74.87108	75.00496
18.15	19.15	84.5798	79.7306	10.34	75.81	70.62	75.4997	75.58433
19.26	20.26	85.361	80.5406	11.34	76.85	71.7	75.91946	75.9714
20.479	21.479	86.2484	81.4604	12.34	77.97	72.86	76.51816	76.52372
21.719	22.719	87.0242	82.265	13.33	79.08	74.01	77.21049	77.16282
22.959	23.959	87.7838	83.0534	14.32	80.13	75.1	77.90307	77.80255
24.15	25.15	88.43	83.723	15.39	81.2	76.22	78.63849	78.48231
25.349	26.349	89.0276	84.3422	16.38	82.17	77.23	79.35561	79.1456
26.599	27.599	89.6522	84.9884	17.38	83.07	78.17	80.04195	79.78084
28.069	29.069	90.3452	85.7066	18.39	83.96	79.08	80.75445	80.44072
28.76	29.76	90.6422	86.0144	19.39	84.75	79.91	81.39731	81.03647
29.99	30.99	91.121	86.5094	20.38	85.45	80.63	81.98446	81.58091
31.229	32.229	91.679	87.0854	21.45	86.23	81.44	82.6689	82.21593
32.459	33.459	92.1362	87.5588	22.45	86.85	82.09	83.21672	82.72449
33.729	34.729	92.606	88.0448	23.43	87.46	82.72	83.77056	83.2389
34.969	35.969	93.0092	88.4642	24.49	88.07	83.35	84.33646	83.76478
36.199	37.199	93.4088	88.8764	25.55	88.63	83.93	84.85766	84.24936
37.229	38.229	93.7742	89.2544	26.55	89.13	84.45	85.32518	84.68425
38.4	39.4	94.163	89.6558	27.55	89.63	84.96	85.79927	85.12543
39.5	40.5	94.4798	89.9834	28.55	90.1	85.45	86.24469	85.5401
40.24	41.24	94.658	90.1688	29.54	90.55	85.92	86.68023	85.94574
41.339	42.339	95.0018	90.5234	30.53	90.94	86.32	87.05294	86.293
42.599	43.599	95.342	90.8762	31.51	91.36	86.75	87.4595	86.67193
43.339	44.339	95.4914	91.0274	32.58	91.81	87.22	87.89883	87.08157
44.469	45.469	95.8352	91.3838	33.57	92.18	87.6	88.25082	87.40988
45.709	46.709	96.1322	91.6916	34.57	92.55	87.98	88.61335	87.74814
47.309	48.309	96.5534	92.1254	35.57	92.88	88.33	88.93268	88.04619
48.52	49.52	96.8558	92.4386	36.56	93.2	88.66	89.24045	88.33353
49.64	50.64	97.0934	92.6834	37.63	93.56	89.03	89.59852	88.66793
50.89	51.89	97.3796	92.9804	38.62	93.9	89.39	89.92816	88.97588
52.15	53.15	97.691	93.3008	39.6	94.22	89.72	90.24394	89.27097
53.42	54.42	97.9448	93.5636	40.6	94.5	90.01	90.52937	89.53776
54.979	55.979	98.3174	93.947	41.59	94.77	90.28	90.79659	89.78761
56.179	57.179	98.5874	94.226	42.64	95.08	90.61	91.10918	90.07995
57.29	58.29	98.8178	94.4636	43.68	95.36	90.89	91.39166	90.3442
58.55	59.55	99.0572	94.7102	44.68	95.6	91.14	91.6243	90.56188
59.829	60.829	99.347	95.0108	45.69	95.89	91.44	91.91165	90.83082
61.069	62.069	99.5882	95.2592	46.7	96.13	91.69	92.15214	91.05595
62.3	63.3	99.7754	95.4518	47.7	96.39	91.96	92.40454	91.29229
63.89	64.89	100.0994	95.7866	48.7	96.65	92.23	92.6643	91.53558
65.059	66.059	100.3064	95.999	49.99	96.96	92.54	92.96364	91.816
66.17	67.17	100.499	96.1988	50.99	97.17	92.77	93.16822	92.0077
67.429	68.429	100.7348	96.4418	52.05	97.42	93.02	93.4149	92.2389
68.66	69.66	100.9742	96.6884	53.05	97.67	93.28	93.65665	92.46552
69.969	70.969	101.1902	96.9134	54.03	97.87	93.48	93.84803	92.64497
71.209	72.209	101.4044	97.133	55.02	98.09	93.71	94.07062	92.85371
72.829	73.829	101.6708	97.4084	56	98.32	93.95	94.29231	93.06165
74.099	75.099	101.8706	97.6136	56.99	98.54	94.18	94.51737	93.2728
75.25	76.25	102.0956	97.8458	57.98	98.75	94.4	94.71496	93.45821
76.54	77.54	102.326	98.0834	58.98	98.95	94.6	94.91393	93.64496
78.17	79.17	102.5546	98.3174	60.03	99.17	94.82	95.13652	93.85391
79.469	80.469	102.794	98.5658	61.09	99.4	95.06	95.35869	94.06251
80.609	81.609	102.956	98.7314	62.07	99.59	95.26	95.55182	94.24388

81.979	82.979	103.1486	98.9312	63.12	99.75	95.42	95.70821	94.39076
83.309	84.309	103.3124	99.1004	64.11	99.94	95.62	95.89995	94.57089
84.15	85.15	103.469	99.2606	65.16	100.15	95.84	96.11273	94.7708
85.609	86.609	103.6346	99.4316	66.21	100.33	96.03	96.28791	94.93542
86.92	87.92	103.784	99.5864	67.26	100.52	96.22	96.47501	95.11128
88.089	89.089	103.9442	99.752	68.33	100.72	96.42	96.67116	95.29567
89.42	90.42	104.1638	99.977	69.39	100.92	96.63	96.86887	95.48156
90.15	91.15	104.2574	100.0742	70.38	101.09	96.81	97.03393	95.63678
91.449	92.449	104.432	100.2542	71.39	101.26	96.99	97.19646	95.78964
92.819	93.819	104.5994	100.4252	72.44	101.44	97.17	97.37073	95.95357
94.42	95.42	104.7902	100.6214	73.42	101.6	97.34	97.5273	96.10087
95.29	96.29	104.9	100.7348	74.47	101.77	97.51	97.6885	96.25255
96.459	97.459	105.0656	100.9058	75.47	101.94	97.69	97.85706	96.41118
97.8	98.8	105.2348	101.0804	76.47	102.13	97.89	98.04115	96.58445
99.089	100.089	105.413	101.2622	77.45	102.31	98.07	98.21476	96.74789
100.76	101.76	105.5948	101.4512	78.44	102.45	98.21	98.3576	96.88237
102.099	103.099	105.7658	101.6276	79.44	102.6	98.37	98.50055	97.01698
103.3	104.3	105.9098	101.7752	80.42	102.79	98.56	98.68669	97.19229
104.699	105.699	106.0988	101.9696	81.41	102.93	98.7	98.82946	97.32677
105.54	106.54	106.1942	102.0686	82.41	103.07	98.85	98.96838	97.45764
106.939	107.939	106.3238	102.2018	83.39	103.2	98.98	99.10259	97.58409
				84.44	103.34	99.13	99.2491	97.72215
				85.44	103.5	99.29	99.40314	97.86731
				86.42	103.61	99.41	99.51808	97.97565
				87.41	103.73	99.53	99.64278	98.09319
				88.41	103.85	99.66	99.76892	98.21212
				89.4	104	99.8	99.91187	98.3469
				90.39	104.16	99.97	100.0677	98.4938
				91.38	104.29	100.11	100.1949	98.61385
				92.39	104.42	100.25	100.3244	98.73596
				93.45	104.55	100.38	100.4598	98.86365
				94.44	104.67	100.5	100.5748	98.97214
				95.49	104.8	100.63	100.6993	99.08963
				96.57	104.94	100.78	100.8398	99.2222
				97.55	105.08	100.92	100.9779	99.35257
				98.54	105.2	101.05	101.0918	99.46009
				99.53	105.34	101.18	101.2272	99.58793
				100.51	105.46	101.31	101.3437	99.69786
				101.51	105.57	101.42	101.454	99.80201
				102.49	105.69	101.55	101.5673	99.90907
				103.55	105.82	101.68	101.6955	100.0301
				104.55	105.94	101.81	101.818	100.1458
				105.54	106.08	101.95	101.9573	100.2774
				106.54	106.19	102.07	102.0652	100.3794
				107.53	106.29	102.16	102.1673	100.4758
				108.52	106.32	102.2	102.2	100.5067

TCTime	Twall	q	h	T(K)	Velocity	density	cp	Rex	St
0	297.02	0	0	296.8553	1.223	1.153	1015.147	73016.87	0
0.99	297.02	2.39	3.81	296.8575	1.392	1.153	1015.119	83109.45	0.002339
2.09	297.02	-0.98	-1.47	296.8556	0.481	1.153	1015.143	28701.54	0.0001
3.1	297.01	-1.87	-2.69	296.8539	0.653	1.153	1015.164	38966.9	-0.00352
4.15	297.01	-1.46	-2.06	296.8532	0	1.153	1015.172	0	#DIV/0!
5.21	297.01	-1.18	-1.65	296.8528	0	1.153	1015.176	0	0.0001
6.21	297.01	-0.21	-0.3	296.8534	0.311	1.153	1015.169	18549.93	0.0001
7.27	297.02	2.83	3.85	296.8566	1.075	1.153	1015.192	64163.34	0.00306
8.32	297.03	17.58	25.09	296.873	0	1.153	1015.18	0	0.0001
9.34	297.05	26.83	37.49	296.8916	9.222	1.153	1015.202	550198.2	0.003473
10.34	297.37	349.01	110.01	297.2135	11.755	1.141	1017.237	689038	0.0001
11.34	297.59	373.81	43.08	297.4286	11.984	1.115	1022.544	677221.9	0.0001
12.34	297.9	528.28	40.09	297.7354	12.033	1.094	1028.54	659170.1	0.0001
13.33	298.25	674.07	40.43	298.0905	12.188	1.076	1034.674	650940.2	0.00298
14.32	298.61	774.96	39.51	298.4459	12.316	1.06	1041.081	643429.8	0.002907
15.39	298.98	861.99	38.62	298.8235	12.427	1.045	1048.222	635671.4	0.002837
16.38	299.35	957.01	39.41	299.192	12.526	1.037	1050.273	632107	0.002889
17.38	299.7	1015.27	39.2	299.5449	12.51	1.03	1050.452	624819.9	0.002896
18.39	300.07	1089.83	40.11	299.9115	12.564	1.025	1050.606	622127.9	0.002965
19.39	300.4	1121.32	39.77	300.2425	12.597	1.021	1050.737	619388.3	0.002943
20.38	300.7	1141.62	39.46	300.5449	12.706	1.018	1050.84	621363.9	0.002903
21.45	301.06	1206.54	40.95	300.8977	12.741	1.015	1050.928	620251.6	0.003013
22.45	301.34	1205.52	40.39	301.1803	12.712	1.013	1050.996	616748	0.002984
23.43	301.63	1239.86	41.22	301.4661	12.742	1.011	1051.049	616554.7	0.003044
24.49	301.92	1257.22	41.64	301.7582	12.631	1.01	1051.091	609900.5	0.003105
25.55	302.19	1261.56	41.66	302.0274	12.655	1.009	1051.128	609919.8	0.003104
26.55	302.43	1266.86	41.76	302.269	12.673	1.008	1051.16	609876.1	0.00311
27.55	302.67	1285.85	42.39	302.5141	12.606	1.007	1051.185	605904.4	0.003177
28.55	302.9	1289.77	42.53	302.7445	12.645	1.007	1051.209	607062.6	0.003177
29.54	303.13	1300.56	43.01	302.9699	12.684	1.006	1051.223	608506.1	0.003206
30.53	303.32	1281.04	42.41	303.1628	12.629	1.006	1051.24	605386.4	0.003175
31.51	303.53	1303.22	43.27	303.3733	12.626	1.005	1051.253	604844.1	0.003244
32.58	303.76	1316.33	43.9	303.6009	12.576	1.005	1051.264	602173.9	0.003304
33.57	303.94	1300.41	43.39	303.7833	12.584	1.005	1051.281	602031.8	0.003264
34.57	304.13	1306.17	43.76	303.9712	12.655	1.004	1051.289	605203.8	0.003276
35.57	304.3	1289.68	43.3	304.1368	12.62	1.004	1051.299	603263.5	0.003251
36.56	304.46	1283.71	43.17	304.2964	12.563	1.004	1051.311	600183.3	0.003256
37.63	304.64	1296.95	43.86	304.4822	12.581	1.004	1051.313	600996.7	0.003303
38.62	304.81	1303.45	44.19	304.6533	12.648	1.003	1051.324	603873.9	0.003313
39.6	304.98	1304.93	44.43	304.8172	12.61	1.003	1051.328	601957.1	0.003341
40.6	305.13	1290.49	44.24	304.9654	12.662	1.003	1051.322	604590.8	0.003313
41.59	305.26	1280.36	44.06	305.1042	12.582	1.003	1051.325	600683.4	0.003321
42.64	305.43	1292.96	44.78	305.2666	12.634	1.003	1051.323	603243.2	0.003361
43.68	305.57	1284.55	44.76	305.4134	12.68	1.004	1051.32	605505.9	0.003344
44.68	305.69	1263.47	44.1	305.5344	12.576	1.003	1051.327	600342.9	0.003326
45.69	305.84	1284.49	45.03	305.6838	12.606	1.003	1051.33	601681.2	0.003388
46.7	305.97	1266.79	44.61	305.8089	12.546	1.003	1051.33	598856	0.003372
47.7	306.1	1270.71	44.85	305.9402	12.56	1.003	1051.337	599316.1	0.003386
48.7	306.24	1276.3	45.26	306.0753	12.53	1.003	1051.337	597876	0.003425
49.99	306.39	1264.14	44.92	306.2311	12.569	1.003	1051.348	599424.2	0.003389
50.99	306.5	1247.55	44.42	306.3376	12.561	1.003	1051.353	598884.5	0.003354
52.05	306.63	1256.46	44.89	306.4661	12.598	1.003	1051.357	600549.4	0.003379
53.05	306.75	1263.48	45.22	306.592	12.611	1.002	1051.365	600934.1	0.003404
54.03	306.85	1242.56	44.51	306.6916	12.605	1.002	1051.374	600440.3	0.003352
55.02	306.97	1251.89	45.07	306.8076	12.578	1.002	1051.371	599191.8	0.003401
56	307.08	1255.05	45.24	306.9231	12.669	1.002	1051.379	603317.1	0.00339
56.99	307.2	1258.23	45.63	307.0404	12.652	1.002	1051.374	602653.9	0.003423
57.98	307.3	1246.11	45.17	307.1435	12.558	1.002	1051.387	597796.7	0.003414
58.98	307.41	1242.51	45.19	307.2472	12.59	1.002	1051.388	599309.1	0.003407
60.03	307.52	1247.87	45.62	307.3633	12.575	1.002	1051.385	598656.9	0.003444
61.09	307.64	1248.68	45.72	307.4792	12.587	1.002	1051.393	599003.1	0.003448
62.07	307.74	1243.41	45.75	307.5799	12.584	1.002	1051.39	598971.4	0.003451

63.12	307.82	1215.49	44.8	307.6615	12.628	1.002	1051.393	600952.4	0.003368
64.11	307.92	1228.95	45.49	307.7616	12.627	1.002	1051.392	600949.2	0.00342
65.16	308.03	1236.24	45.99	307.8727	12.632	1.002	1051.389	601269.4	0.003456
66.21	308.12	1219.96	45.47	307.9641	12.631	1.001	1051.394	601093.6	0.00342
67.26	308.22	1221.14	45.63	308.0618	12.695	1.001	1051.397	604073.7	0.003415
68.33	308.32	1223.24	45.83	308.1643	12.673	1.001	1051.401	602909.8	0.003436
69.39	308.43	1225.81	46.06	308.2675	12.653	1.001	1051.403	601894.4	0.003459
70.38	308.51	1216.59	45.79	308.3538	12.644	1.001	1051.408	601297.3	0.003441
71.39	308.6	1210.42	45.58	308.4387	12.66	1.001	1051.415	601858.1	0.003421
72.44	308.69	1209.95	45.63	308.5298	12.686	1.001	1051.421	602916.8	0.003418
73.42	308.77	1205.55	45.55	308.6116	12.665	1.001	1051.425	601859.5	0.003417
74.47	308.86	1199.84	45.34	308.6959	12.636	1	1051.433	600233.9	0.003413
75.47	308.94	1205.15	45.67	308.784	12.623	1	1051.435	599583.7	0.003441
76.47	309.04	1214.88	46.11	308.8803	12.607	1	1051.441	598614.8	0.003479
77.45	309.13	1215.55	46.19	308.9711	12.651	1	1051.447	600525	0.003472
78.44	309.21	1199.8	45.77	309.0458	12.636	1	1051.445	599907.3	0.003445
79.44	309.28	1193.7	45.56	309.1205	12.624	1	1051.452	599132.8	0.003432
80.42	309.38	1215.18	46.48	309.2179	12.709	1	1051.456	603047.2	0.003478
81.41	309.45	1198.04	46.01	309.2927	12.634	1	1051.453	599598.7	0.003464
82.41	309.53	1190.65	45.83	309.3654	12.781	1	1051.454	606548.4	0.00341
83.39	309.6	1185.56	45.83	309.4356	12.681	1	1051.45	601923.3	0.003437
84.44	309.67	1183.34	45.99	309.5123	12.679	1	1051.443	601995.6	0.00345
85.44	309.75	1189.12	46.26	309.593	12.643	1	1051.449	600137.9	0.00348
86.42	309.81	1170.79	45.73	309.6531	12.674	1	1051.444	601713.2	0.003432
87.41	309.88	1168.3	45.83	309.7184	12.662	1	1051.439	601303.2	0.003442
88.41	309.94	1164.93	45.92	309.7845	12.639	1	1051.433	600354.2	0.003455
89.4	310.02	1171.96	46.21	309.8594	12.675	1	1051.44	601874.1	0.003467
90.39	310.1	1180.64	46.63	309.941	12.651	1	1051.444	600605.2	0.003506
91.38	310.17	1168.97	46.25	310.0077	12.681	1	1051.447	601982.8	0.003469
92.39	310.24	1165.28	46.22	310.0755	12.638	1	1051.448	599935.4	0.003478
93.45	310.31	1162.45	46.33	310.1465	12.615	1	1051.442	598972.3	0.003493
94.44	310.37	1154.26	46.03	310.2067	12.583	1	1051.447	597303	0.003479
95.49	310.43	1151.25	45.93	310.272	12.633	1	1051.453	599546.3	0.003458
96.57	310.51	1154.84	46.22	310.3457	12.733	1	1051.452	604312.8	0.003452
97.55	310.58	1160.97	46.57	310.4181	12.658	1	1051.454	600678.5	0.003499
98.54	310.64	1149.36	46.11	310.4778	12.679	1	1051.461	601506.8	0.003459
99.53	310.71	1157.16	46.48	310.5488	12.645	1	1051.465	599766.3	0.003496
100.51	310.77	1149.41	46.22	310.6099	12.638	0.999	1051.469	599329.8	0.003482
101.51	310.83	1142.08	46.03		12.617	0.999	1051.469	598361.3	0.003473
102.49	310.89	1141.18	46		12.631	0.999	1051.475	598840.6	0.003467
103.55	310.95	1142.22	46.13		12.633	0.999	1051.477	598890.1	0.003476
104.55	311.02	1142.64	46.31		12.663	0.999	1051.475	600379.6	0.003482
105.54	311.09	1152.46	46.84		12.658	0.999	1051.475	600087.9	0.003523
106.54	311.15	1138.49	46.34		12.668	0.999	1051.477	600517.2	0.003482
107.53	311.2	1131.52	46.19		12.642	0.999	1051.475	599326.4	0.003478
108.52	311.22	1089.25	44.54		12.63	0.999	1051.473	598860.7	0.003357
					13.038	0.979	1070.338	607343.9	0
					13.009	0.979	1070.339	605935.4	0
					13	0.979	1070.34	605505.9	0
					12.937	0.979	1070.349	602352.4	0
					12.994	0.979	1070.35	604991.9	0
					13.019	0.979	1070.349	606124.4	0
					13.01	0.979	1070.354	605584.8	0
					12.965	0.979	1070.358	603389.4	0
					13.012	0.979	1070.357	605639.9	0
					13.042	0.979	1070.358	606976.1	0
					12.95	0.979	1070.357	602727.8	0

Fuel Panels, 1 blower 08 Feb 01

Delta time	Tcmiddle	Tcpanel	Tcin	UInf	rho	Cp	mu	Pr	Time	Re
0	75.567	76.017	-1552.56	0.604	1.154	1013.586	18.397	0.723	96.65	36087.59
1.053	75.491	75.96	75.835	0	1.154	1013.568	18.396	0.723	97.703	0
2.148	75.511	75.963	75.831	0.662	1.154	1013.569	18.396	0.723	98.798	39567
3.198	75.565	75.966	75.897	0	1.154	1013.57	18.396	0.723	99.848	0
4.182	75.537	75.906	75.872	0	1.154	1013.551	18.394	0.723	100.832	0
5.172	75.539	75.897	75.917	0	1.154	1013.548	18.394	0.723	101.822	0
6.223	75.488	75.878	75.88	0.743	1.154	1013.542	18.393	0.723	102.873	44425.2
7.211	75.547	75.882	75.888	0.752	1.154	1013.543	18.394	0.723	103.861	44944.1
8.196	75.609	75.902	75.924	0.91	1.154	1013.549	18.394	0.723	104.846	54402.89
9.246	75.595	75.905	75.94	0	1.154	1013.55	18.394	0.723	105.896	0
10.299	75.558	75.86	75.963	0	1.154	1013.536	18.393	0.723	106.949	0
11.357	75.529	75.817	75.956	1.147	1.154	1013.522	18.392	0.723	108.007	68562.03
12.343	75.545	75.854	75.938	0	1.154	1013.534	18.393	0.723	108.993	0
13.342	75.586	75.891	76.018	11.414	1.154	1013.546	18.394	0.723	109.992	682117.6
14.34	75.557	81.267	79.501	12.25	1.141	1015.417	18.534	0.724	110.99	718409.2
15.34	75.54	89.656	84.328	12.365	1.121	1019.007	18.751	0.728	111.99	704189.6
16.339	75.563	97.231	89.109	12.559	1.103	1023.144	18.944	0.731	112.989	696433.6
17.331	75.556	104.007	93.519	12.754	1.086	1027.764	19.114	0.736	113.981	690422.4
18.319	75.541	109.946	97.698	12.546	1.071	1032.687	19.26	0.741	114.969	664825.8
19.309	75.525	115.681	101.51	12.169	1.057	1038.36	19.399	0.746	115.959	631505.1
20.327	75.638	120.401	105.008	12.248	1.045	1043.338	19.51	0.751	116.977	624778.6
21.325	75.614	124.296	108.361	12.257	1.038	1043.528	19.604	0.751	117.975	618085.1
22.312	75.606	127.426	111.258	12.332	1.032	1043.686	19.679	0.75	118.962	616183.7
23.3	75.57	130.068	113.925	12.252	1.028	1043.824	19.742	0.75	119.95	607502.2
24.297	75.545	132.311	116.402	12.251	1.024	1043.944	19.796	0.749	120.947	603500.9
25.314	75.561	134.075	118.703	12.263	1.021	1044.04	19.838	0.749	121.964	601018.4
26.301	75.545	135.492	120.645	12.35	1.018	1044.118	19.872	0.749	122.951	602823.5
27.288	75.545	136.671	122.435	12.373	1.016	1044.184	19.9	0.749	123.938	601888.9
28.341	75.561	137.635	124.224	12.395	1.015	1044.239	19.923	0.749	124.991	601293.4
29.334	75.578	138.398	125.683	12.29	1.013	1044.282	19.941	0.749	125.984	594912.3
30.322	75.569	138.911	127.051	12.391	1.013	1044.312	19.953	0.749	126.972	598909.2
31.321	75.604	139.445	128.282	12.311	1.012	1044.343	19.965	0.748	127.971	594179.1
32.317	75.544	139.823	129.293	12.278	1.011	1044.365	19.974	0.748	128.967	591909.1
33.305	75.549	140.1	130.291	12.238	1.011	1044.381	19.981	0.748	129.955	589519.6
34.356	75.554	140.479	131.307	12.289	1.01	1044.403	19.99	0.748	131.006	591325.6
35.41	75.619	140.793	132.26	12.194	1.009	1044.421	19.997	0.748	132.06	586227.6
36.399	75.633	140.913	132.965	12.27	1.009	1044.428	20	0.748	133.049	589724.9
37.387	75.612	141.12	133.692	12.285	1.009	1044.44	20.005	0.748	134.037	590096.9
38.383	75.618	141.355	134.394	12.214	1.008	1044.454	20.011	0.748	135.033	586271
39.382	75.651	141.527	135.018	12.253	1.008	1044.464	20.015	0.748	136.032	587850.2
40.368	75.681	141.725	135.58	12.212	1.008	1044.476	20.02	0.748	137.018	585582.5
41.355	75.72	141.876	136.175	12.236	1.008	1044.485	20.023	0.748	138.005	586479.7
42.341	75.788	142.002	136.665	12.218	1.007	1044.493	20.026	0.748	138.991	585403.6
43.393	75.836	142.097	137.136	12.198	1.007	1044.498	20.028	0.748	140.043	584275.9
44.391	75.885	142.268	137.583	12.206	1.007	1044.508	20.032	0.748	141.041	584377.6
45.392	75.898	142.29	137.984	12.278	1.007	1044.51	20.033	0.748	142.042	587786.4
46.387	75.979	142.381	138.406	12.221	1.007	1044.515	20.035	0.748	143.037	584878.8
47.38	76.02	142.504	138.695	12.215	1.006	1044.522	20.038	0.748	144.03	584408.5
48.367	76.016	142.549	139.025	12.205	1.006	1044.525	20.039	0.748	145.017	583863.1
49.42	76.057	142.636	139.33	12.266	1.006	1044.53	20.041	0.748	146.07	586607.3
50.409	76.161	142.597	139.572	12.268	1.006	1044.528	20.04	0.748	147.059	586782.6
51.396	76.25	142.738	139.86	12.256	1.006	1044.536	20.044	0.748	148.046	585982.2
52.448	76.283	142.784	140.084	12.307	1.006	1044.539	20.045	0.748	149.098	588316.2
53.529	76.338	142.831	140.294	12.217	1.006	1044.542	20.046	0.748	150.179	583975.7
54.524	76.488	142.829	140.528	12.282	1.006	1044.542	20.046	0.748	151.174	587063.9
55.521	76.512	142.876	140.653	12.294	1.006	1044.545	20.047	0.748	152.171	587581
56.572	76.565	142.912	140.808	12.269	1.006	1044.547	20.048	0.748	153.222	586324.5
57.559	76.717	142.944	140.999	12.33	1.006	1044.549	20.048	0.748	154.209	589174.8
58.545	76.807	143.044	141.134	12.31	1.006	1044.555	20.051	0.748	155.195	588055.9
59.533	76.838	143.128	141.302	12.267	1.005	1044.56	20.053	0.748	156.183	585870.7
60.532	76.91	143.141	141.408	12.311	1.005	1044.56	20.053	0.748	157.182	587910.6
61.528	77.007	143.173	141.562	12.285	1.005	1044.562	20.054	0.748	158.178	586655

62.577	77.161	143.299	141.741	12.274	1.005	1044.57	20.057	0.748	159.227	585913.8
63.629	77.307	143.314	141.882	12.276	1.005	1044.571	20.057	0.748	160.279	585965.3
64.678	77.407	143.446	142.04	12.264	1.005	1044.579	20.06	0.748	161.328	585190.4
65.665	77.461	143.528	142.159	12.334	1.005	1044.584	20.062	0.748	162.315	588376.3
66.652	77.525	143.537	142.222	12.279	1.005	1044.584	20.062	0.748	163.302	585744.4
67.702	77.632	143.67	142.345	12.244	1.005	1044.592	20.066	0.748	164.352	583842.1
68.687	77.718	143.768	142.461	12.285	1.004	1044.598	20.068	0.748	165.337	585852.6
69.676	77.821	143.863	142.575	12.279	1.004	1044.604	20.07	0.748	166.326	585195.8
70.738	77.947	144.021	142.747	12.217	1.004	1044.613	20.074	0.748	167.388	582003.8
71.739	78.001	144.076	142.793	12.236	1.004	1044.617	20.075	0.748	168.389	582806.3
72.735	78.148	144.245	142.949	12.263	1.004	1044.627	20.079	0.748	169.385	583832.5
73.722	78.237	144.268	143.051	12.336	1.004	1044.628	20.08	0.748	170.372	587224.6
74.721	78.355	144.319	143.125	12.262	1.003	1044.631	20.081	0.748	171.371	583637.8
75.719	78.471	144.409	143.221	12.28	1.003	1044.637	20.083	0.748	172.369	584370.9
76.706	78.59	144.413	143.289	12.221	1.003	1044.637	20.083	0.748	173.356	581535.6
77.767	78.696	144.451	143.381	12.259	1.003	1044.639	20.084	0.748	174.417	583283.2
78.762	78.841	144.499	143.448	12.283	1.003	1044.642	20.085	0.748	175.412	584351.2
79.75	78.915	144.523	143.543	12.315	1.003	1044.644	20.086	0.748	176.4	585843.5
80.737	79.067	144.586	143.641	12.212	1.003	1044.648	20.087	0.748	177.387	580811.7
81.789	79.168	144.577	143.688	12.194	1.003	1044.647	20.087	0.748	178.439	579961.9
82.849	79.296	144.551	143.734	12.209	1.003	1044.646	20.086	0.748	179.499	580729.7
83.845	79.396	144.586	143.77	12.215	1.003	1044.648	20.087	0.748	180.495	580976.2
84.829	79.513	144.633	143.806	12.258	1.003	1044.651	20.088	0.748	181.479	582946.2
85.883	79.664	144.667	143.824	12.2	1.003	1044.652	20.089	0.748	182.533	580133.5
86.869	79.791	144.712	143.924	12.226	1.003	1044.655	20.09	0.748	183.519	581264.5
87.857	79.907	144.79	143.98	12.184	1.003	1044.66	20.092	0.748	184.507	579177.5
88.841	79.957	144.818	144.06	12.125	1.003	1044.662	20.093	0.748	185.491	576304.7
89.827	80.092	144.885	144.087	12.249	1.003	1044.666	20.094	0.748	186.477	582096.4
90.814	80.18	144.915	144.14	12.239	1.002	1044.668	20.095	0.748	187.464	581555.4
91.866	80.371	144.982	144.157	12.193	1.002	1044.672	20.097	0.748	188.516	579260.8
92.852	80.487	144.965	144.209	12.195	1.002	1044.671	20.096	0.748	189.502	579397.8
93.838	80.633	144.988	144.252	12.276	1.002	1044.672	20.097	0.748	190.488	583224.8
94.888	80.783	145.032	144.272	12.265	1.002	1044.675	20.098	0.748	191.538	582625.7
95.941	80.834	145.047	144.356	12.202	1.002	1044.676	20.098	0.748	192.591	579567.4
96.927	80.939	145.012	144.324	12.207	1.002	1044.673	20.097	0.748	193.577	579903.1
97.924	81.05	144.924	144.322	12.275	1.002	1044.668	20.095	0.748	194.574	583273.1
98.92	81.219	144.89	144.353	12.269	1.003	1044.666	20.094	0.748	195.57	583022.1
99.918	81.322	144.904	144.369	12.211	1.002	1044.667	20.095	0.748	196.568	580232.4
100.916	81.463	144.867	144.363	12.293	1.003	1044.665	20.094	0.748	197.566	584206.1
101.968	81.563	144.872	144.367	12.238	1.003	1044.665	20.094	0.748	198.618	581572.6
102.97	81.719	144.861	144.365	12.202	1.003	1044.664	20.094	0.748	199.62	579903.6
103.957	81.83	144.852	144.362	12.219	1.003	1044.664	20.094	0.748	200.607	580711.8
104.953	81.926	144.882	144.391	12.165	1.003	1044.666	20.094	0.748	201.603	578107.7
105.95	82.021	144.881	144.402	12.256	1.003	1044.666	20.094	0.748	202.6	582424.4
106.935	82.151	144.843	144.357	12.235	1.003	1044.663	20.093	0.748	203.585	581483.9
107.923	82.265	144.831	144.347	12.324	1.003	1044.662	20.093	0.748	204.573	585735.8
108.969	82.419	144.809	144.353	12.265	1.003	1044.661	20.093	0.748	205.619	582976.8
109.958	82.508	144.828	144.361	12.24	1.003	1044.662	20.093	0.748	206.608	581742.6
111.006	82.651	144.805	144.393	12.174	1.003	1044.661	20.092	0.748	207.656	578643.4
112.011	82.806	144.847	144.383	12.19	1.003	1044.663	20.093	0.748	208.661	579364.1
112.996	82.892	144.82	144.367	12.258	1.003	1044.662	20.093	0.748	209.646	582641.6
114.048	83.022	144.871	144.357	12.261	1.003	1044.665	20.094	0.748	210.698	582687.1
115.032	83.111	144.854	144.354	12.313	1.003	1044.664	20.094	0.748	211.682	585202.9
116.083	83.223	144.908	144.386	12.28	1.002	1044.667	20.095	0.748	212.733	583500.6
117.135	83.329	144.927	144.384	12.228	1.002	1044.668	20.095	0.748	213.785	581025.8
118.122	83.445	144.964	144.36	12.15	1.002	1044.671	20.096	0.748	214.772	577256.8
119.117	83.533	144.966	144.426	12.166	1.002	1044.671	20.096	0.748	215.767	577988.3
120.113	83.736	144.967	144.44	12.221	1.002	1044.671	20.096	0.748	216.763	580603.8
121.1	83.853	145.042	144.448	12.234	1.002	1044.675	20.098	0.748	217.75	581138.1
122.15	83.928	145.107	144.525	12.184	1.002	1044.679	20.1	0.748	218.8	578613.4
123.258	84.058	145.153	144.505	12.232	1.002	1044.682	20.101	0.748	219.908	580846.1
124.253	84.165	145.152	144.564	12.204	1.002	1044.682	20.101	0.748	220.903	579532.6

time adjustment									
IR data 0.5 second									
IR time	Irtimeadj	IRT, amb=76	IRT, amb=145	TC time	IR Temp, ε	IR Temp, ε	IR Temp a	Poly fit	
0	0.5	74.903	69.5102	0	74.9	69.51	74.9	75.0316	
1	1.5000002	74.93	69.539	1.05	74.92	69.53	74.92341	75.05318	
2.161	2.6610003	74.9444	69.5534	2.15	74.94	69.55	74.94323	75.07144	
3.33	3.8300004	74.903	69.5102	3.2	74.93	69.53	74.93305	75.06206	
4.07	4.5700003	74.9102	69.5192	4.18	74.91	69.51	74.91665	75.04694	
5.11	5.6100004	74.9048	69.512	5.17	74.91	69.52	74.91719	75.04744	
6.24	6.7400002	74.8958	69.503	6.22	74.9	69.51	74.90832	75.03927	
7.401	7.9010003	74.8778	69.485	7.21	74.89	69.5	74.89808	75.02984	
8.57	9.0700004	74.912	69.521	8.2	74.89	69.49	74.89689	75.02874	
9.74	10.24	74.9228	69.53	9.25	74.91	69.52	74.91671	75.047	
10.941	11.441	74.9102	69.5174	10.3	74.92	69.53	74.9294	75.0587	
11.641	12.141	74.912	69.5192	11.36	74.91	69.52	74.92198	75.05185	
12.71	13.21	74.903	69.5102	12.34	74.91	69.52	74.91976	75.04981	
13.881	14.381001	75.7364	70.3814	13.34	75	69.61	75.00755	75.1307	
15.08	15.58	77.4284	72.1436	14.34	75.71	70.35	75.39562	75.48838	
16.281	16.781	79.0916	73.877	15.34	77.09	71.79	76.27326	76.29775	
17.511	18.011001	80.9096	75.7706	16.34	78.48	73.24	77.20965	77.16204	
18.71	19.21	82.283	77.198	17.33	79.9	74.72	78.22388	78.09902	
19.45	19.95	83.0498	77.9954	18.32	81.26	76.14	79.22824	79.02776	
20.551	21.051001	84.2756	79.268	19.31	82.39	77.3	80.01481	79.75571	
21.75	22.25	85.4546	80.4938	20.33	83.47	78.43	80.81216	80.49418	
22.99	23.490001	86.5958	81.6782	21.32	84.55	79.55	81.65892	81.27901	
24.22	24.72	87.6218	82.742	22.31	85.51	80.55	82.43148	81.99561	
25.46	25.96	88.5488	83.7032	23.3	86.42	81.5	83.18327	82.69343	
26.691	27.191	89.4236	84.6122	24.3	87.27	82.38	83.89896	83.35819	
27.96	28.46	90.3038	85.523	25.31	88.07	83.2	84.59332	84.00357	
29.2	29.7	90.9878	86.2322	26.3	88.79	83.96	85.22847	84.59427	
30.431	30.931	91.6736	86.9414	27.29	89.49	84.68	85.85787	85.17997	
31.931	32.431	92.4224	87.7172	28.34	90.22	85.44	86.53014	85.80594	
33.131	33.631001	92.9984	88.3148	29.33	90.79	86.02	87.05445	86.29441	
34.261	34.761	93.515	88.8494	30.32	91.33	86.59	87.56373	86.7691	
35.551	36.051	94.0532	89.4056	31.32	91.87	87.14	88.07175	87.24284	
36.83	37.33	94.6418	90.0158	32.32	92.37	87.66	88.54912	87.6882	
38.08	38.580001	95.117	90.5072	33.31	92.84	88.15	89.00253	88.11139	
39.34	39.84	95.603	91.0094	34.36	93.33	88.66	89.46983	88.54773	
40.61	41.11	96.071	91.4936	35.41	93.79	89.13	89.91103	88.95987	
41.24	41.74	96.2798	91.7096	36.4	94.21	89.57	90.32384	89.34564	
42.521	43.021	96.737	92.183	37.39	94.66	90.04	90.76145	89.75475	
43.811	44.311	97.1798	92.6402	38.38	95.04	90.43	91.12738	90.09697	
45.07	45.57	97.583	93.056	39.38	95.43	90.83	91.50708	90.45219	
46.311	46.811	97.9934	93.479	40.37	95.8	91.21	91.86522	90.78736	
47.59	48.09	98.366	93.866	41.35	96.15	91.58	92.20618	91.10654	
48.881	49.381001	98.7458	94.2566	42.34	96.49	91.93	92.53863	91.41787	
50.151	50.651	99.1292	94.6544	43.39	96.86	92.31	92.90294	91.75913	
51.48	51.98	99.5324	95.072	44.39	97.21	92.67	93.2427	92.0775	
53.051	53.551	99.8996	95.45	45.39	97.53	93	93.56138	92.37621	
54.32	54.820001	100.2434	95.8064	46.39	97.85	93.33	93.87594	92.67113	
55.45	55.95	100.5152	96.0854	47.38	98.16	93.65	94.17857	92.95496	
56.791	57.291	100.8608	96.4418	48.37	98.45	93.95	94.46588	93.22449	
58.051	58.551	101.1398	96.7298	49.42	98.76	94.27	94.77067	93.5105	
59.291	59.791001	101.4602	97.061	50.41	99.06	94.58	95.073	93.79428	
60.62	61.12	101.7644	97.376	51.4	99.36	94.89	95.36456	94.06802	
61.96	62.46	102.0308	97.6496	52.45	99.64	95.18	95.6418	94.32839	
63.531	64.031	102.4016	98.033	53.53	99.89	95.44	95.88899	94.56058	
64.791	65.291	102.6608	98.3012	54.52	100.16	95.72	96.15911	94.81438	
65.931	66.431001	102.9632	98.6108	55.52	100.41	95.98	96.40629	95.04669	
67.2	67.7	103.1864	98.843	56.57	100.68	96.25	96.67414	95.29847	
68.511	69.011001	103.4528	99.1166	57.56	100.92	96.5	96.91222	95.52232	
69.771	70.271001	103.784	99.4586	58.55	101.14	96.73	97.12623	95.72359	
71.08	71.58	104.0108	99.6926	59.53	101.39	96.99	97.3712	95.95402	
72.33	72.83	104.2628	99.9536	60.53	101.63	97.24	97.61042	96.17909	
73.651	74.151001	104.5112	100.2092	61.53	101.85	97.46	97.82851	96.38431	

74.97	75.47	104.7758	100.481	62.58	102.06	97.68	98.03096	96.57487
76.34	76.84	105.0494	100.7654	63.63	102.31	97.93	98.28006	96.80937
77.71	78.21	105.2978	101.0192	64.68	102.53	98.17	98.49216	97.00908
79.041	79.541	105.5444	101.2748	65.67	102.76	98.4	98.71725	97.22107
80.681	81.181	105.7694	101.507	66.65	103	98.65	98.95671	97.44665
81.411	81.911	105.881	101.6222	67.7	103.19	98.84	99.13875	97.61816
82.75	83.25	106.1546	101.903	68.69	103.39	99.05	99.33288	97.8011
84.11	84.61	106.3724	102.128	69.68	103.63	99.3	99.56719	98.02194
85.48	85.980001	106.5758	102.3368	70.74	103.86	99.54	99.78773	98.22985
86.86	87.36	106.8098	102.578	71.74	104.04	99.73	99.96443	98.39646
88.22	88.72	107.0582	102.8354	72.73	104.24	99.93	100.1543	98.57553
89.021	89.521	107.1914	102.9722	73.72	104.43	100.13	100.3429	98.75344
90.23	90.730001	107.3714	103.1558	74.72	104.63	100.33	100.5399	98.93923
91.551	92.051	107.5316	103.3214	75.72	104.83	100.53	100.7345	99.12286
92.96	93.46	107.753	103.5518	76.71	105.02	100.74	100.9243	99.30194
93.801	94.301001	107.8916	103.6922	77.77	105.22	100.94	101.122	99.48857
94.99	95.49	108.0716	103.8794	78.76	105.4	101.13	101.2991	99.65578
96.391	96.891001	108.2804	104.0936	79.75	105.57	101.3	101.4677	99.81494
97.261	97.761001	108.4046	104.2214	80.74	105.71	101.44	101.6039	99.94358
98.811	99.311	108.572	104.3942	81.79	105.86	101.6	101.7544	100.0858
100.1	100.6	108.7646	104.5922	82.85	106.07	101.82	101.966	100.2856
101.301	101.801	108.8924	104.7254	83.84	106.25	102	102.1439	100.4537
102.671	103.171	109.067	104.9036	84.83	106.4	102.16	102.2911	100.5927
104	104.5	109.2704	105.1124	85.88	106.56	102.32	102.449	100.742
105.431	105.931	109.4306	105.278	86.87	106.73	102.49	102.6163	100.9002
106.801	107.301	109.5818	105.4346	87.86	106.9	102.67	102.7817	101.0564
108.171	108.671	109.7636	105.62	88.84	107.08	102.86	102.96	101.225
				89.83	107.24	103.02	103.116	101.3726
				90.81	107.38	103.17	103.2542	101.5033
				91.87	107.51	103.3	103.3802	101.6224
				92.85	107.66	103.45	103.5312	101.7653
				93.84	107.82	103.61	103.6898	101.9154
				94.89	107.98	103.78	103.8472	102.0643
				95.94	108.14	103.95	104.0063	102.2148
				96.93	108.29	104.1	104.1584	102.3588
				97.92	108.42	104.24	104.2937	102.4868
				98.92	108.53	104.35	104.4057	102.5929
				99.92	108.66	104.49	104.5349	102.7152
				100.92	108.8	104.63	104.6771	102.8499
				101.97	108.91	104.75	104.7868	102.9538
				102.97	109.04	104.88	104.9174	103.0775
				103.96	109.19	105.03	105.068	103.2201
				104.95	109.32	105.16	105.1962	103.3416
				105.95	109.43	105.28	105.3062	103.4459
				106.94	109.54	105.39	105.4185	103.5523
				107.92	109.66	105.52	105.5392	103.6667
				108.97	109.76	105.62	105.6405	103.7627
				109.96	109.76	105.62	105.6394	103.7616
				111.01	109.76	105.62	105.6408	103.7629
				112.01	109.76	105.62	105.6383	103.7606
				113	109.76	105.62	105.6399	103.7621
				114.05	109.76	105.62	105.6368	103.7592
				115.03	109.76	105.62	105.6378	103.7602
				116.08	109.76	105.62	105.6346	103.7571
				117.14	109.76	105.62	105.6335	103.756
				118.12	109.76	105.62	105.6313	103.7539
				119.12	109.76	105.62	105.6311	103.7538
				120.11	109.76	105.62	105.6311	103.7537
				121.1	109.76	105.62	105.6266	103.7495
				122.15	109.76	105.62	105.6227	103.7458
				123.26	109.76	105.62	105.6199	103.7432
				124.25	109.76	105.62	105.62	103.7432

TCTime	Twall	q	h	T(K)	Velocity	density	cp	Rex	St
0	297.07	0	0	296.9064	0.604	1.154	1013.586	36087.59	0
1.05	297.08	12.18	24.17	296.9184	0	1.154	1013.568	0	#DIV/0!
2.15	297.09	15.03	30.35	296.9286	0.662	1.154	1013.569	39567	0.039196
3.2	297.08	2.78	5.53	296.9234	0	1.154	1013.57	0	#DIV/0!
4.18	297.07	-4.5	-9.43	296.915	0	1.154	1013.551	0	#DIV/0!
5.17	297.08	0.62	1.31	296.9152	0	1.154	1013.548	0	#DIV/0!
6.22	297.07	-3.62	-7.77	296.9107	0.743	1.154	1013.542	44425.2	-0.00894
7.21	297.07	-6.31	-13.32	296.9055	0.752	1.154	1013.543	44944.1	-0.01514
8.2	297.06	-3.24	-6.68	296.9049	0.91	1.154	1013.549	54402.89	-0.00628
9.25	297.07	8.25	17.3	296.915	0	1.154	1013.55	0	#DIV/0!
10.3	297.08	9.29	20.87	296.9215	0	1.154	1013.536	0	#DIV/0!
11.36	297.08	0.87	2.04	296.9177	1.147	1.154	1013.522	68562.03	0.001521
12.34	297.08	0.98	2.2	296.9166	0	1.154	1013.534	0	#DIV/0!
13.34	297.12	48.34	114.45	296.9615	11.414	1.154	1013.546	682117.6	0.008573
14.34	297.32	227.79	70.95	297.1602	12.25	1.141	1015.417	718409.2	0.004999
15.34	297.77	570.17	76.83	297.6099	12.365	1.121	1019.007	704189.6	0.005439
16.34	298.25	773.51	69.38	298.09	12.559	1.103	1023.144	696433.6	0.004895
17.33	298.77	969.5	67.36	298.6106	12.754	1.086	1027.764	690422.4	0.004732
18.32	299.29	1111.08	64.69	299.1265	12.546	1.071	1032.687	664825.8	0.004662
19.31	299.69	1120.06	56.12	299.5309	12.169	1.057	1038.36	631505.1	0.004202
20.33	300.1	1180.76	53.26	299.9412	12.248	1.045	1043.338	624778.6	0.003988
21.32	300.54	1285.07	53.77	300.3772	12.257	1.038	1043.528	618085.1	0.00405
22.31	300.94	1325.78	52.53	300.7753	12.332	1.032	1043.686	616183.7	0.003955
23.3	301.32	1373.18	52.17	301.163	12.252	1.028	1043.824	607502.2	0.003968
24.3	301.69	1404.12	51.63	301.5323	12.251	1.024	1043.944	603500.9	0.003942
25.31	302.05	1433.85	51.54	301.8909	12.263	1.021	1044.04	601018.4	0.003943
26.3	302.38	1448.41	51.22	302.219	12.35	1.018	1044.118	602823.5	0.003902
27.29	302.7	1475.63	51.58	302.5444	12.373	1.016	1044.184	601888.9	0.003929
28.34	303.05	1511.75	52.5	302.8922	12.395	1.015	1044.239	601293.4	0.003996
29.33	303.32	1486.43	51.35	303.1636	12.29	1.013	1044.282	594912.3	0.00395
30.32	303.59	1487.91	51.36	303.4273	12.391	1.013	1044.312	598909.2	0.003918
31.32	303.85	1496.53	51.6	303.6905	12.311	1.012	1044.343	594179.1	0.003966
32.32	304.1	1494.22	51.59	303.9379	12.278	1.011	1044.365	591909.1	0.00398
33.31	304.33	1493.42	51.71	304.173	12.238	1.011	1044.381	589519.6	0.004002
34.36	304.58	1495.11	51.82	304.4154	12.289	1.01	1044.403	591325.6	0.003998
35.41	304.8	1490.22	51.75	304.6444	12.194	1.009	1044.421	586227.6	0.004027
36.4	305.02	1493.69	52.14	304.8587	12.27	1.009	1044.428	589724.9	0.004032
37.39	305.25	1514.25	53.06	305.086	12.285	1.009	1044.44	590096.9	0.004098
38.38	305.44	1489.73	52.31	305.2761	12.214	1.008	1044.454	586271	0.004068
39.38	305.63	1493.38	52.63	305.4734	12.253	1.008	1044.464	587850.2	0.00408
40.37	305.82	1488.12	52.59	305.6596	12.212	1.008	1044.476	585582.5	0.00409
41.35	306	1482.68	52.57	305.837	12.236	1.008	1044.485	586479.7	0.004081
42.34	306.17	1477.15	52.56	306.0099	12.218	1.007	1044.493	585403.6	0.00409
43.39	306.36	1483.79	53.06	306.1995	12.198	1.007	1044.498	584275.9	0.004136
44.39	306.54	1484.79	53.25	306.3764	12.206	1.007	1044.508	584377.6	0.004148
45.39	306.7	1477.4	53.28	306.5423	12.278	1.007	1044.51	587786.4	0.004126
46.39	306.87	1475.48	53.43	306.7062	12.221	1.007	1044.515	584878.8	0.004157
47.38	307.02	1471.93	53.47	306.8639	12.215	1.006	1044.522	584408.5	0.004166
48.37	307.17	1464.15	53.43	307.0136	12.205	1.006	1044.525	583863.1	0.004166
49.42	307.33	1462.67	53.59	307.1725	12.266	1.006	1044.53	586607.3	0.004158
50.41	307.49	1471.19	54.26	307.3302	12.268	1.006	1044.528	586782.6	0.004209
51.4	307.64	1470.14	54.37	307.4822	12.256	1.006	1044.536	585982.2	0.004222
52.45	307.79	1455.79	54.08	307.6269	12.307	1.006	1044.539	588316.2	0.004182
53.53	307.92	1432.32	53.41	307.7559	12.217	1.006	1044.542	583975.7	0.00416
54.52	308.06	1447.23	54.25	307.8969	12.282	1.006	1044.542	587063.9	0.004203
55.52	308.19	1437.17	54.09	308.0259	12.294	1.006	1044.545	587581	0.004187
56.57	308.33	1439.07	54.4	308.1658	12.269	1.006	1044.547	586324.5	0.00422
57.56	308.45	1431.93	54.35	308.2902	12.33	1.006	1044.549	589174.8	0.004195
58.55	308.56	1416.72	53.89	308.402	12.31	1.006	1044.555	588055.9	0.004166
59.53	308.69	1428.67	54.51	308.53	12.267	1.005	1044.56	585870.7	0.004233
60.53	308.82	1426.19	54.66	308.655	12.311	1.005	1044.56	587910.6	0.004229
61.53	308.93	1415.1	54.44	308.7691	12.285	1.005	1044.562	586655	0.004221

62.58	309.03	1397.05	53.82	308.8749	12.274	1.005	1044.57	585913.8	0.004177
63.63	309.17	1413.67	54.72	309.0052	12.276	1.005	1044.571	585965.3	0.004246
64.68	309.28	1398.44	54.21	309.1162	12.264	1.005	1044.579	585190.4	0.004211
65.67	309.39	1407.7	54.72	309.2339	12.334	1.005	1044.584	588376.3	0.004226
66.65	309.52	1419.58	55.44	309.3592	12.279	1.005	1044.584	585744.4	0.004301
67.7	309.61	1386.41	54.19	309.4545	12.244	1.005	1044.592	583842.1	0.004216
68.69	309.72	1388.27	54.36	309.5562	12.285	1.004	1044.598	585652.6	0.004219
69.68	309.84	1408.07	55.29	309.6789	12.279	1.004	1044.604	585195.8	0.004293
70.74	309.95	1399.85	55.03	309.7944	12.217	1.004	1044.613	582003.8	0.004295
71.74	310.05	1382.18	54.46	309.8869	12.236	1.004	1044.617	582806.3	0.004244
72.73	310.15	1383.55	54.53	309.9864	12.263	1.004	1044.627	583832.5	0.00424
73.72	310.25	1381.48	54.63	310.0852	12.336	1.004	1044.628	587224.6	0.004222
74.72	310.35	1383.66	54.88	310.1885	12.262	1.003	1044.631	583637.8	0.004272
75.72	310.45	1382.97	54.97	310.2905	12.28	1.003	1044.637	584370.9	0.004272
76.71	310.55	1381.46	55.12	310.39	12.221	1.003	1044.637	581535.6	0.004305
77.77	310.65	1378.23	55.18	310.4936	12.259	1.003	1044.639	583283.2	0.004296
78.76	310.75	1373.03	55.11	310.5865	12.283	1.003	1044.642	584351.2	0.004282
79.75	310.83	1366.08	55	310.675	12.315	1.003	1044.644	585843.5	0.004262
80.74	310.91	1344.88	54.23	310.7464	12.212	1.003	1044.648	580811.7	0.004238
81.79	310.99	1337.74	54.12	310.8254	12.194	1.003	1044.647	579961.9	0.004236
82.85	311.1	1362.77	55.42	310.9364	12.209	1.003	1044.646	580729.7	0.004332
83.84	311.19	1359.21	55.44	311.0298	12.215	1.003	1044.648	580976.2	0.004332
84.83	311.27	1343.05	54.89	311.1071	12.258	1.003	1044.651	582946.2	0.004274
85.88	311.35	1337.62	54.81	311.19	12.2	1.003	1044.652	580133.5	0.004288
86.87	311.44	1343.74	55.21	311.2779	12.226	1.003	1044.655	581264.5	0.00431
87.86	311.52	1343.66	55.3	311.3647	12.184	1.003	1044.66	579177.5	0.004332
88.84	311.62	1351.89	55.82	311.4584	12.125	1.003	1044.662	576304.7	0.004394
89.83	311.7	1342.15	55.52	311.5403	12.249	1.003	1044.666	582096.4	0.004326
90.81	311.77	1330.53	55.17	311.6129	12.239	1.002	1044.668	581555.4	0.004306
91.87	311.84	1312.25	54.48	311.6791	12.193	1.002	1044.672	579260.8	0.004269
92.85	311.92	1322.51	55.11	311.7585	12.195	1.002	1044.671	579397.8	0.004317
93.84	312	1326.77	55.45	311.8419	12.276	1.002	1044.672	583224.8	0.004315
94.89	312.08	1322.59	55.41	311.9246	12.265	1.002	1044.675	582625.7	0.004316
95.94	312.17	1322.2	55.56	312.0082	12.202	1.002	1044.676	579567.4	0.00435
96.93	312.25	1322.82	55.82	312.0882	12.207	1.002	1044.673	579903.1	0.004369
97.92	312.32	1313.63	55.72	312.1594	12.275	1.002	1044.668	583273.1	0.004337
98.92	312.38	1296.37	55.17	312.2183	12.269	1.003	1044.666	583022.1	0.004292
99.92	312.45	1297.35	55.35	312.2862	12.211	1.002	1044.667	580232.4	0.00433
100.92	312.52	1301.82	55.77	312.361	12.293	1.003	1044.665	584206.1	0.00433
101.97	312.58	1281.07	55.01		12.238	1.003	1044.665	581572.6	0.00429
102.97	312.65	1286.98	55.44		12.202	1.003	1044.664	579903.6	0.004336
103.96	312.73	1297.96	56.12		12.219	1.003	1044.664	580711.8	0.004383
104.95	312.79	1289.44	55.87		12.165	1.003	1044.666	578107.7	0.004383
105.95	312.85	1276.28	55.44		12.256	1.003	1044.666	582424.4	0.004317
106.94	312.91	1271.91	55.45		12.235	1.003	1044.663	581483.9	0.004325
107.92	312.97	1273.14	55.67		12.324	1.003	1044.662	585735.8	0.004311
108.97	313.03	1256.74	55.11		12.265	1.003	1044.661	582976.8	0.004288
109.96	313.03	1196.15	52.43		12.24	1.003	1044.662	581742.6	0.004088
111.01	313.03	1168.08	51.23		12.174	1.003	1044.661	578643.4	0.004016
112.01	313.03	1144.52	50.14		12.19	1.003	1044.663	579364.1	0.003926
113	313.03	1127.67	49.44		12.258	1.003	1044.662	582641.6	0.003849
114.05	313.03	1108.24	48.52		12.261	1.003	1044.665	582687.1	0.003777
115.03	313.03	1095	47.96		12.313	1.003	1044.664	585202.9	0.003717
116.08	313.03	1078.59	47.18		12.28	1.002	1044.667	583500.6	0.00367
117.14	313.02	1065.44	46.58		12.228	1.002	1044.668	581025.8	0.003639
118.12	313.02	1052.98	45.99		12.15	1.002	1044.671	577256.8	0.003616
119.12	313.02	1042.45	45.53		12.166	1.002	1044.671	577988.3	0.003575
120.11	313.02	1032.02	45.07		12.221	1.002	1044.671	580603.8	0.003523
121.1	313.02	1019.56	44.44		12.234	1.002	1044.675	581138.1	0.00347
122.15	313.02	1008.78	43.9		12.184	1.002	1044.679	578613.4	0.003442
123.26	313.02	998.54	43.4		12.232	1.002	1044.682	580846.1	0.00339
124.25	313.02	990.88	43.07		12.204	1.002	1044.682	579532.6	0.003371

Erosion/Deposit #1 Panels, 1 blower 08 Feb 01

Delta time	Tcmlittle	Tcpanel	Tc1n	Uinf	rho	Cp	mu	Pr	Time	Re
0	76.958	76.55	132804.7	1.581	1.152	1013.76	18.411	0.723	51.565	94265.71
0.996	76.922	76.524	76.224	0	1.153	1013.751	18.41	0.723	52.561	0
2.092	76.978	76.524	76.772	1.218	1.153	1013.751	18.41	0.723	53.657	72603.04
3.079	76.998	76.578	76.776	0	1.152	1013.769	18.412	0.723	54.644	0
4.068	76.98	76.527	76.775	1.775	1.153	1013.752	18.41	0.723	55.633	105855.3
5.124	76.968	76.536	76.817	0	1.152	1013.755	18.411	0.723	56.689	0
6.198	76.969	76.533	76.83	0	1.152	1013.754	18.411	0.723	57.763	0
7.183	76.934	76.55	76.787	0	1.152	1013.76	18.411	0.723	58.748	0
8.167	76.951	76.569	76.806	0	1.152	1013.766	18.412	0.723	59.732	0
9.221	76.968	76.572	76.811	8.479	1.152	1013.767	18.412	0.723	60.786	505483.5
10.222	76.981	79.758	78.894	11.198	1.145	1014.862	18.495	0.724	61.787	660202.5
11.229	77.006	88.16	83.397	11.603	1.125	1018.298	18.712	0.727	62.794	664273.4
12.23	76.971	96.002	87.993	11.662	1.106	1022.405	18.913	0.731	63.795	649521.4
13.22	76.947	102.908	92.379	11.842	1.089	1026.947	19.086	0.735	64.785	643574.9
14.278	77.041	109.371	96.794	11.947	1.073	1032.17	19.246	0.74	65.843	634421.3
15.267	76.971	114.516	100.557	12.088	1.06	1037.127	19.371	0.745	66.832	629998.6
16.267	76.991	119.048	104.129	12.266	1.048	1042.172	19.478	0.75	67.832	628648.3
17.255	77.02	122.886	107.309	12.156	1.04	1043.458	19.57	0.751	68.82	615531.6
18.254	77.046	126.112	110.325	12.385	1.035	1043.619	19.647	0.75	69.819	621239.3
19.263	77.016	128.812	113	12.345	1.03	1043.758	19.712	0.75	70.828	614339.2
20.321	76.967	131.031	115.578	12.418	1.026	1043.875	19.765	0.75	71.886	614008.7
21.308	77.003	132.76	117.733	12.208	1.023	1043.968	19.806	0.749	72.873	600601.4
22.366	76.958	134.271	119.927	12.319	1.02	1044.051	19.842	0.749	73.931	603456.5
23.451	76.977	135.484	121.798	12.406	1.018	1044.118	19.871	0.749	75.016	605584.7
24.449	77.069	136.325	123.33	12.415	1.017	1044.165	19.891	0.749	76.014	604544.8
25.448	77.03	137.083	124.812	12.312	1.016	1044.208	19.909	0.749	77.013	598254.8
26.448	77.011	137.719	126.138	12.203	1.015	1044.244	19.924	0.749	78.013	591845.3
27.436	77.062	138.305	127.355	12.215	1.014	1044.277	19.938	0.749	79.001	591445.7
28.491	77.089	138.796	128.574	12.29	1.013	1044.305	19.95	0.749	80.056	594243.4
29.488	77.076	139.14	129.575	12.328	1.012	1044.325	19.958	0.749	81.053	595491.9
30.488	77.118	139.46	130.504	12.282	1.012	1044.344	19.966	0.748	82.053	592721.9
31.477	77.093	139.796	131.379	12.165	1.011	1044.363	19.974	0.748	83.042	586541.6
32.465	77.135	140.009	132.213	12.108	1.011	1044.375	19.979	0.748	84.03	583425.7
33.462	77.195	140.317	132.998	12.124	1.01	1044.393	19.986	0.748	85.027	583668.4
34.451	77.196	140.553	133.71	12.176	1.01	1044.407	19.992	0.748	86.016	585782.1
35.438	77.26	140.744	134.304	12.172	1.009	1044.418	19.996	0.748	87.003	585268.9
36.424	77.252	140.954	134.902	12.129	1.009	1044.431	20.001	0.748	87.989	582858.5
37.412	77.305	141.101	135.436	12.296	1.009	1044.439	20.005	0.748	88.977	590658.4
38.398	77.395	141.293	136.016	12.144	1.009	1044.451	20.009	0.748	89.963	583003.3
39.453	77.445	141.5	136.493	12.214	1.008	1044.463	20.014	0.748	91.018	586036.1
40.451	77.422	141.646	136.932	12.209	1.008	1044.471	20.018	0.748	92.016	585568.4
41.457	77.487	141.737	137.391	12.16	1.008	1044.477	20.02	0.748	93.022	583023.6
42.538	77.549	141.935	137.782	12.248	1.007	1044.489	20.025	0.748	94.103	586930.5
43.617	77.621	142.011	138.129	12.266	1.007	1044.493	20.026	0.748	95.182	587657.3
44.634	77.741	142.021	138.509	12.13	1.007	1044.494	20.027	0.748	96.199	581119.7
45.639	77.726	142.098	138.776	12.26	1.007	1044.498	20.028	0.748	97.204	587236.1
46.879	77.844	142.244	139.135	12.273	1.007	1044.507	20.032	0.748	98.444	587621.8
47.937	77.883	142.337	139.413	12.271	1.007	1044.512	20.034	0.748	99.502	587387.4
48.949	77.976	142.288	139.619	12.262	1.007	1044.51	20.033	0.748	100.514	587024.1
49.935	78.042	142.39	139.871	12.12	1.007	1044.516	20.035	0.748	101.5	580030.3
50.93	78.104	142.396	140.058	12.322	1.007	1044.516	20.035	0.748	102.495	589689.5
52.24	78.246	142.383	140.218	12.259	1.007	1044.515	20.035	0.748	103.805	586713.4
53.338	78.248	142.41	140.389	12.278	1.007	1044.517	20.036	0.748	104.903	587583.2
54.392	78.348	142.364	140.542	12.383	1.007	1044.514	20.035	0.748	105.957	592659.4
55.458	78.491	142.384	140.648	12.281	1.007	1044.515	20.035	0.748	107.023	587767.8
56.456	78.545	142.395	140.763	12.158	1.007	1044.516	20.035	0.748	108.021	581841.3
57.517	78.626	142.463	140.875	12.342	1.007	1044.52	20.037	0.748	109.082	590557.6
58.515	78.699	142.508	140.989	12.189	1.006	1044.523	20.038	0.748	110.08	583159.7
59.511	78.806	142.674	141.167	12.161	1.006	1044.532	20.042	0.748	111.076	581519.3
60.561	78.911	142.756	141.295	12.238	1.006	1044.537	20.044	0.748	112.126	585089.7
61.566	79.007	142.808	141.463	12.242	1.006	1044.541	20.045	0.748	113.131	585201.7
62.554	79.055	142.842	141.538	12.326	1.006	1044.543	20.046	0.748	114.119	589158.6

63.605	79.136	142.922	141.641	12.233	1.006	1044.547	20.048	0.748	115.17	584555.8
64.663	79.26	142.957	141.735	12.234	1.006	1044.549	20.049	0.748	116.228	584572.3
65.677	79.355	143.02	141.801	12.261	1.006	1044.553	20.05	0.748	117.242	585727.4
66.664	79.461	142.942	141.835	12.266	1.006	1044.549	20.048	0.748	118.229	586118.6
67.715	79.503	142.925	141.922	12.228	1.006	1044.547	20.048	0.748	119.28	584333.4
68.699	79.608	142.879	141.934	12.266	1.006	1044.545	20.047	0.748	120.264	586237.7
69.749	79.743	142.835	141.994	12.156	1.006	1044.542	20.046	0.748	121.314	581046.4
70.752	79.858	142.835	141.96	12.135	1.006	1044.542	20.046	0.748	122.317	580013.1
71.8	79.93	142.939	142.016	12.099	1.006	1044.548	20.048	0.748	123.365	578151.6
72.784	80.053	142.887	142.04	12.116	1.006	1044.545	20.047	0.748	124.349	579032.3
73.782	80.17	143.023	142.128	12.166	1.006	1044.553	20.05	0.748	125.347	581203.9
74.768	80.239	143.024	142.199	12.204	1.006	1044.553	20.05	0.748	126.333	583006.9
75.764	80.32	143.1	142.243	12.142	1.005	1044.558	20.052	0.748	127.329	579953.1
76.761	80.425	143.263	142.326	12.13	1.005	1044.568	20.056	0.748	128.326	579082.4
77.754	80.522	143.291	142.439	12.238	1.005	1044.569	20.057	0.748	129.319	584188.3
78.738	80.644	143.331	142.542	12.115	1.005	1044.572	20.058	0.748	130.303	578281.8
79.79	80.801	143.519	142.698	12.091	1.005	1044.583	20.062	0.748	131.355	576809.4
80.775	80.857	143.579	142.714	12.222	1.005	1044.587	20.063	0.748	132.34	582937.4
81.835	80.967	143.623	142.809	12.277	1.005	1044.589	20.065	0.748	133.4	585486.3
82.83	81.046	143.687	142.89	12.249	1.005	1044.593	20.066	0.748	134.395	584068.6
83.817	81.176	143.742	142.962	12.326	1.004	1044.597	20.067	0.748	135.382	587625.7
84.804	81.273	143.91	143.011	12.187	1.004	1044.607	20.071	0.748	136.369	580742.8
85.864	81.396	143.961	143.117	12.335	1.004	1044.61	20.073	0.748	137.429	587692.4
86.859	81.444	143.992	143.174	12.289	1.004	1044.612	20.073	0.748	138.424	585488
87.844	81.503	144.053	143.214	12.217	1.004	1044.615	20.075	0.748	139.409	581926
88.894	81.639	144.144	143.239	12.304	1.004	1044.621	20.077	0.748	140.459	585908.3
89.888	81.758	144.205	143.334	12.195	1.004	1044.625	20.078	0.748	141.453	580646.8
90.883	81.891	144.241	143.398	12.311	1.004	1044.627	20.079	0.748	142.448	586110.1
91.879	81.95	144.301	143.489	12.316	1.003	1044.63	20.081	0.748	143.444	586247.9
92.867	82.113	144.256	143.505	12.295	1.004	1044.628	20.079	0.748	144.432	585308.3
93.92	82.191	144.302	143.533	12.286	1.003	1044.63	20.081	0.748	145.485	584824.1
94.97	82.269	144.314	143.582	12.206	1.003	1044.631	20.081	0.748	146.535	580965.8
96.022	82.378	144.323	143.583	12.253	1.003	1044.632	20.081	0.748	147.587	583196.9
97.073	82.5	144.331	143.61	12.32	1.003	1044.632	20.081	0.748	148.638	586404.3
98.123	82.536	144.331	143.613	12.165	1.003	1044.632	20.081	0.748	149.688	579018.6
99.106	82.638	144.291	143.654	12.155	1.004	1044.63	20.08	0.748	150.671	578614.4
100.091	82.728	144.265	143.624	12.223	1.004	1044.628	20.08	0.748	151.656	581871.1
101.077	82.918	144.294	143.683	12.221	1.004	1044.63	20.08	0.748	152.642	581740.3
102.062	82.997	144.248	143.702	12.185	1.004	1044.627	20.079	0.748	153.627	580075.4
103.049	83.079	144.299	143.717	12.122	1.004	1044.63	20.081	0.748	154.614	577006.4
104.033	83.195	144.289	143.75	12.231	1.004	1044.63	20.08	0.748	155.598	582224.6
105.018	83.251	144.307	143.76	12.259	1.003	1044.631	20.081	0.748	156.583	583539.3
106.015	83.317	144.407	143.734	12.213	1.003	1044.637	20.083	0.748	157.58	581168.4
107.012	83.477	144.419	143.831	12.182	1.003	1044.637	20.083	0.748	158.577	579675.7
107.995	83.6	144.433	143.848	12.178	1.003	1044.638	20.084	0.748	159.56	579458.4
108.991	83.689	144.421	143.92	12.208	1.003	1044.638	20.083	0.748	160.556	580879.1
109.984	83.77	144.586	143.943	12.231	1.003	1044.648	20.087	0.748	161.549	581742.1
110.972	83.833	144.589	143.977	12.16	1.003	1044.648	20.087	0.748	162.537	578362.9
112.025	83.932	144.589	143.98	12.239	1.003	1044.648	20.087	0.748	163.59	582076.8
113.071	84.06	144.548	144.016	12.196	1.003	1044.645	20.086	0.748	164.636	580120.3
114.055	84.146	144.599	143.994	12.271	1.003	1044.648	20.088	0.748	165.62	583596.6
115.052	84.244	144.626	143.987	12.242	1.003	1044.65	20.088	0.748	166.617	582162.1
116.049	84.358	144.624	143.998	12.292	1.003	1044.65	20.088	0.748	167.614	584567.3
117.036	84.407	144.548	143.983	12.213	1.003	1044.645	20.086	0.748	168.601	580952.8
118.021	84.555	144.535	144.051	12.256	1.003	1044.645	20.086	0.748	169.586	582980.9
119.006	84.636	144.603	144.077	12.245	1.003	1044.649	20.088	0.748	170.571	582352.5
120.067	84.72	144.579	144.077	12.255	1.003	1044.647	20.087	0.748	171.632	582898.7
121.065	84.785	144.738	144.108	12.25	1.003	1044.657	20.091	0.748	172.63	582362
122.06	84.953	144.781	144.116	12.316	1.003	1044.659	20.092	0.748	173.625	585425.7
123.065	85.041	144.763	144.175	12.302	1.003	1044.658	20.091	0.748	174.63	584826.9
124.051	85.128	144.833	144.192	12.253	1.003	1044.663	20.093	0.748	175.616	582348.2
125.101	85.226	144.826	144.203	12.332	1.003	1044.662	20.093	0.748	176.666	586148.6
126.166	85.286	144.81	144.263	12.301	1.003	1044.661	20.093	0.748	177.731	584678.5
127.18	85.423	144.937	144.29	12.335	1.002	1044.669	20.096	0.748	178.745	586109.3

time adjustment									
IR data 0 second									
IR time	ltimeadj	IRT, amb=77	IRT, amb=144	TC time	IR Temp, ε	IR Temp, α	IR Temp α	Poly fit	
0	0	76.5302	71.3732	0	76.53	71.37	76.53	76.53465	
1.071	1.0710004	76.5392	71.3732	0.996	76.54	71.37	76.54152	76.54528	
2.071	2.071	76.5662	71.4002	2.092	76.57	71.4	76.57152	76.57297	
3.141	3.1410002	76.5572	71.3912	3.079	76.56	71.39	76.55836	76.56083	
4.041	4.0410004	76.5428	71.375	4.068	76.54	71.38	76.54135	76.54512	
5.041	5.041	76.55	71.3822	5.124	76.55	71.38	76.55082	76.55386	
6.24	6.2400002	76.5356	71.3678	6.198	76.54	71.37	76.54099	76.5448	
7.47	7.4700001	76.5482	71.3804	7.183	76.55	71.38	76.55	76.55311	
8.681	8.6810005	76.5572	71.3912	8.167	76.55	71.39	76.54889	76.55208	
10.24	10.240001	76.5644	71.3984	9.221	76.56	71.39	76.55871	76.56115	
11.411	11.411	77.3474	72.2138	10.222	76.56	71.4	76.37236	76.38919	
12.48	12.48	78.6434	73.562	11.229	77.23	72.09	76.55092	76.55396	
13.71	13.71	80.2544	75.2378	12.23	78.34	73.25	77.20224	77.1552	
14.951	14.951	81.8024	76.8452	13.22	79.61	74.57	78.0683	77.95524	
16.181	16.181	83.309	78.4112	14.278	80.96	75.97	79.04028	78.85389	
17.451	17.451	84.7256	79.8818	15.267	82.19	77.25	79.96934	79.71362	
18.72	18.72	86.0378	81.2426	16.267	83.4	78.51	80.91426	80.58879	
20.021	20.021	87.2888	82.5404	17.255	84.51	79.65	81.79978	81.40963	
20.72	20.720001	87.8738	83.1452	18.254	85.56	80.74	82.66109	82.20868	
22.021	22.021001	88.9502	84.2594	19.263	86.56	81.78	83.50316	82.9905	
23.321	23.321	89.9348	85.28	20.321	87.54	82.8	84.35337	83.7805	
24.391	24.391	90.626	85.9964	21.308	88.36	83.65	85.07224	84.44894	
25.661	25.661	91.391	86.7884	22.366	89.21	84.53	85.83386	85.15762	
26.791	26.791	92.0768	87.4958	23.451	90.02	85.37	86.57291	85.84578	
28.161	28.161	92.8544	88.3004	24.449	90.66	86.03	87.16372	86.39624	
29.5	29.5	93.497	88.9664	25.448	91.26	86.66	87.71939	86.91423	
30.301	30.301001	93.8858	89.3696	26.448	91.87	87.28	88.29219	87.44847	
31.46	31.46	94.406	89.9078	27.436	92.44	87.87	88.82791	87.94839	
32.161	32.161	94.7534	90.266	28.491	93.01	88.46	89.36919	88.45374	
33.5	33.500001	95.342	90.8744	29.488	93.49	88.96	89.82907	88.8833	
34.33	34.33	95.675	91.2164	30.488	93.97	89.46	90.29035	89.31434	
35.5	35.5	96.1484	91.706	31.477	94.41	89.92	90.7107	89.7073	
36.6	36.6	96.5768	92.1488	32.465	94.89	90.4	91.17824	90.14455	
37.87	37.870001	97.0448	92.6312	33.462	95.33	90.86	91.60023	90.53935	
39.071	39.071	97.448	93.0506	34.451	95.72	91.27	91.97642	90.89145	
40.37	40.37	97.9088	93.5258	35.438	96.12	91.68	92.36525	91.2555	
41.71	41.710001	98.3768	94.0082	36.424	96.51	92.08	92.74297	91.60926	
43.08	43.08	98.7782	94.424	37.412	96.88	92.46	93.10437	91.94787	
44.38	44.38	99.1544	94.811	38.398	97.22	92.82	93.43314	92.25599	
45.71	45.71	99.5936	95.2646	39.453	97.58	93.19	93.78103	92.58214	
46.451	46.451	99.7538	95.4302	40.451	97.94	93.55	94.13249	92.91174	
48.051	48.051	100.2128	95.9036	41.457	98.29	93.92	94.47717	93.23509	
49.291	49.291	100.5476	96.2492	42.538	98.62	94.26	94.79559	93.53389	
50.521	50.521	100.8122	96.5228	43.617	98.93	94.58	95.10114	93.8207	
51.88	51.88	101.1866	96.908	44.634	99.24	94.9	95.41056	94.11121	
53.22	53.22	101.4692	97.1996	45.639	99.57	95.24	95.73605	94.41692	
54.59	54.59	101.8436	97.5848	46.879	99.88	95.56	96.03752	94.70013	
55.921	55.921	102.1226	97.8728	47.937	100.18	95.87	96.33208	94.97693	
57.521	57.521	102.4502	98.2094	48.949	100.46	96.15	96.61494	95.24282	
58.321	58.321	102.6284	98.3948	49.935	100.69	96.39	96.83898	95.45345	
59.49	59.490001	102.821	98.5946	50.93	100.92	96.64	97.06862	95.66941	
60.86	60.86	103.1306	98.9132	52.24	101.26	96.99	97.40939	95.98994	
62.23	62.23	103.4492	99.239	53.338	101.5	97.23	97.64781	96.21426	
63.031	63.031001	103.6274	99.4244	54.392	101.79	97.53	97.9405	96.48971	
64.24	64.240001	103.874	99.6782	55.458	102.03	97.77	98.17933	96.71453	
65.561	65.561	104.0882	99.8996	56.456	102.23	97.99	98.37868	96.90223	
66.901	66.901	104.3402	100.1588	57.517	102.45	98.21	98.59471	97.10566	
68.58	68.58	104.6768	100.5062	58.515	102.66	98.43	98.80207	97.30097	
69.87	69.87	104.8946	100.7312	59.511	102.83	98.6	98.96236	97.45197	
71.071	71.071	105.0656	100.9058	60.561	103.06	98.84	99.18757	97.66416	
71.87	71.87	105.1646	101.0084	61.566	103.29	99.08	99.41453	97.87805	
73.08	73.080001	105.3806	101.2298	62.554	103.52	99.31	99.64254	98.09297	

74.411	74.411	105.593	101.4494	63.605	103.74	99.54	99.85786	98.29597
75.771	75.771	105.8234	101.687	64.663	103.94	99.75	100.0558	98.48263
77.441	77.441	106.0682	101.939	65.677	104.11	99.92	100.2221	98.63949
78.74	78.740001	106.2662	102.1424	66.664	104.3	100.11	100.4167	98.82301
79.951	79.951	106.4966	102.38	67.715	104.5	100.33	100.6177	99.01264
81.35	81.35	106.7054	102.596	68.699	104.7	100.53	100.8204	99.2039
82.71	82.71	106.8944	102.7886	69.749	104.87	100.71	100.9929	99.36677
83.58	83.58	107.0348	102.9344	70.752	105.02	100.86	101.1429	99.50836
84.781	84.781	107.2112	103.1162	71.8	105.16	101	101.2769	99.63478
86.391	86.391	107.4704	103.3826	72.784	105.33	101.18	101.4499	99.79817
87.291	87.291	107.654	103.5716	73.782	105.49	101.35	101.602	99.94174
88.521	88.521	107.7746	103.6958	74.768	105.65	101.51	101.7619	100.0928
89.901	89.901	107.9942	103.9226	75.764	105.82	101.69	101.9274	100.2492
91.291	91.291001	108.194	104.126	76.761	105.97	101.84	102.0679	100.3819
92.661	92.661	108.3866	104.3258	77.754	106.12	101.99	102.2163	100.5221
94.041	94.041	108.5432	104.4878	78.738	106.27	102.14	102.3639	100.6616
95.691	95.691001	108.7322	104.6804	79.79	106.47	102.35	102.5529	100.8402
97.061	97.061	108.9572	104.9126	80.775	106.62	102.51	102.6994	100.9787
98.33	98.33	109.112	105.0728	81.835	106.77	102.66	102.8469	101.1181
99.201	99.201	109.2038	105.1664	82.83	106.91	102.81	102.9831	101.2469
100.431	100.431	109.3532	105.3212	83.817	107.07	102.97	103.1399	101.3952
101.801	101.801	109.5026	105.4742	84.804	107.21	103.12	103.2701	101.5183
103.451	103.451	109.697	105.674	85.864	107.39	103.3	103.4471	101.6857
104.301	104.301	109.7528	105.7316	86.859	107.57	103.48	103.6253	101.8543
105.541	105.541	109.9382	105.9224	87.844	107.71	103.63	103.7617	101.9834
106.941	106.941	110.1128	106.1024	88.894	107.83	103.76	103.8764	102.0919
108.271	108.271	110.2712	106.2644	89.888	107.99	103.92	104.0328	102.2399
109.641	109.641	110.4296	106.4264	90.883	108.14	104.07	104.1807	102.3799
111.041	111.041	110.5772	106.5794	91.879	108.28	104.21	104.3172	102.5091
				92.867	108.41	104.35	104.4498	102.6347
				93.92	108.53	104.47	104.5671	102.7458
				94.97	108.65	104.6	104.6864	102.8588
				96.022	108.79	104.74	104.8259	102.9909
				97.073	108.96	104.91	104.9954	103.1514
				98.123	109.09	105.05	105.1254	103.2746
				99.106	109.19	105.16	105.2278	103.3716
				100.091	109.31	105.28	105.3493	103.4867
				101.077	109.42	105.39	105.4576	103.5893
				102.062	109.53	105.51	105.5703	103.6961
				103.049	109.65	105.63	105.6873	103.807
				104.033	109.74	105.71	105.7779	103.8929
				105.018	109.86	105.84	105.8968	104.0057
				106.015	110	105.98	106.031	104.1329
				107.012	110.12	106.11	106.1503	104.246
				107.995	110.24	106.23	106.2695	104.359
				108.991	110.35	106.35	106.3802	104.464
				109.984	110.47	106.46	106.4905	104.5687
				110.972	110.57	106.57	106.5904	104.6634
				112.025	110.58	106.58	106.6004	104.6729
				113.071	110.58	106.58	106.6028	104.6751
				114.055	110.58	106.58	106.5998	104.6723
				115.052	110.58	106.58	106.5982	104.6708
				116.049	110.58	106.58	106.5983	104.6709
				117.036	110.58	106.58	106.6028	104.6751
				118.021	110.58	106.58	106.6035	104.6759
				119.006	110.58	106.58	106.5995	104.6721
				120.067	110.58	106.58	106.6009	104.6734
				121.065	110.58	106.58	106.5916	104.6646
				122.06	110.58	106.58	106.5891	104.6622
				123.065	110.58	106.58	106.5902	104.6632
				124.051	110.58	106.58	106.5861	104.6593
				125.101	110.58	106.58	106.5865	104.6597
				126.166	110.58	106.58	106.5874	104.6606
				127.18	110.58	106.58	106.58	104.6536

TCTime	Twall	q	h	T(K)	Velocity	density	cp	Rex	St	0
0	297.9	0	0	297.7415	1.581	1.152	1013.76	94265.71	0	
1	297.91	6.16	-521.1	297.7474	0	1.153	1013.751	0	#DIV/0!	
2.09	297.92	17.76	-652.89	297.7628	1.218	1.153	1013.751	72603.04	-0.4586	
3.08	297.92	1.42	149.3	297.756	0	1.152	1013.769	0	#DIV/0!	
4.07	297.91	-5.36	532.25	297.7473	1.775	1.153	1013.752	105855.3	0.256541	
5.12	297.91	4.69	-472.15	297.7521	0	1.152	1013.755	0	#DIV/0!	
6.2	297.91	-2.7	411.21	297.7471	0	1.152	1013.754	0	#DIV/0!	
7.18	297.91	4.79	-2775.51	297.7517	0	1.152	1013.76	0	#DIV/0!	
8.17	297.91	1.7	180.78	297.7512	0	1.152	1013.766	0	#DIV/0!	
9.22	297.92	6.82	1131.97	297.7562	8.479	1.152	1013.767	505483.5	0.114314	
10.22	297.82	-95.65	-51.11	297.6607	11.198	1.145	1014.862	660202.5	-0.00393	
11.23	297.91	57.05	8.85	297.7522	11.603	1.125	1018.298	664273.4	0.000666	
12.23	298.25	358.28	34.22	298.0862	11.662	1.106	1022.405	649521.4	0.002595	
13.22	298.69	615.89	44.43	298.5307	11.842	1.089	1026.947	643574.9	0.003355	
14.28	299.19	807.35	47.62	299.0299	11.947	1.073	1032.17	634421.3	0.003599	
15.27	299.67	956.39	49.46	299.5076	12.088	1.06	1037.127	629998.6	0.003722	
16.27	300.15	1085.18	50.79	299.9938	12.266	1.048	1042.172	628648.3	0.003791	
17.25	300.61	1171.54	50.84	300.4498	12.156	1.04	1043.458	615531.6	0.003854	
18.25	301.05	1246	51.08	300.8937	12.385	1.035	1043.619	621239.3	0.003818	
19.26	301.49	1311.96	51.54	301.3281	12.345	1.03	1043.758	614339.2	0.003883	
20.32	301.93	1369.84	52.18	301.7669	12.418	1.026	1043.875	614008.7	0.003923	
21.31	302.3	1390.98	51.83	302.1383	12.208	1.023	1043.968	600601.4	0.003975	
22.37	302.69	1433.43	52.54	302.532	12.319	1.02	1044.051	603456.5	0.004005	
23.45	303.07	1460.67	52.97	302.9143	12.406	1.018	1044.118	605584.7	0.004017	
24.45	303.38	1450	52.27	303.2201	12.415	1.017	1044.165	604544.8	0.003965	
25.45	303.67	1449.79	52.02	303.5079	12.312	1.016	1044.208	598254.8	0.003983	
26.45	303.96	1474.9	52.81	303.8047	12.203	1.015	1044.244	591845.3	0.004083	
27.44	304.24	1482.25	52.98	304.0824	12.215	1.014	1044.277	591445.7	0.004096	
28.49	304.52	1485.65	53.12	304.3632	12.29	1.013	1044.305	594243.4	0.004086	
29.49	304.76	1472.23	52.73	304.6018	12.328	1.012	1044.325	595491.9	0.004047	
30.49	305	1477.88	53.05	304.8413	12.282	1.012	1044.344	592721.9	0.004087	
31.48	305.22	1468.1	52.76	305.0596	12.165	1.011	1044.363	586541.6	0.004108	
32.47	305.46	1497.92	54.07	305.3025	12.108	1.011	1044.375	583425.7	0.004229	
33.46	305.68	1489.08	53.85	305.5219	12.124	1.01	1044.393	583668.4	0.004211	
34.45	305.88	1472.36	53.37	305.7175	12.176	1.01	1044.407	585782.1	0.004155	
35.44	306.08	1479.07	53.8	305.9197	12.172	1.009	1044.418	585268.9	0.004194	
36.42	306.28	1479.33	53.96	306.1163	12.129	1.009	1044.431	582858.5	0.004222	
37.41	306.46	1475.12	54.02	306.3044	12.296	1.009	1044.439	590658.4	0.004169	
38.4	306.64	1460.57	53.61	306.4756	12.144	1.009	1044.451	583003.3	0.004189	
39.45	306.82	1456.12	53.58	306.6567	12.214	1.008	1044.463	586036.1	0.004167	
40.45	307	1468.2	54.23	306.8399	12.209	1.008	1044.471	585568.4	0.004219	
41.46	307.18	1469.98	54.55	307.0195	12.16	1.008	1044.477	583023.6	0.004261	
42.54	307.35	1448.26	53.86	307.1855	12.248	1.007	1044.489	586930.5	0.004181	
43.62	307.5	1437.02	53.68	307.3448	12.266	1.007	1044.493	587657.3	0.004161	
44.63	307.67	1444.56	54.27	307.5062	12.13	1.007	1044.494	581119.7	0.004254	
45.64	307.84	1458.31	55.05	307.6761	12.26	1.007	1044.498	587236.1	0.004269	
46.88	307.99	1419.06	53.73	307.8334	12.273	1.007	1044.507	587621.8	0.004162	
47.94	308.15	1428.85	54.31	307.9872	12.271	1.007	1044.512	587387.4	0.004208	
48.95	308.29	1431.38	54.77	308.1349	12.262	1.007	1044.51	587024.1	0.004247	
49.94	308.41	1405.48	53.9	308.2519	12.12	1.007	1044.516	580030.3	0.004228	
50.93	308.53	1398.38	53.87	308.3719	12.322	1.007	1044.516	589689.5	0.004156	
52.24	308.71	1410.31	54.72	308.55	12.259	1.007	1044.515	586713.4	0.004244	
53.34	308.83	1388.98	54.12	308.6746	12.278	1.007	1044.517	587583.2	0.004191	
54.39	308.99	1415.92	55.56	308.8276	12.383	1.007	1044.514	592659.4	0.004266	
55.46	309.11	1395.38	55	308.9525	12.281	1.007	1044.515	587767.8	0.004258	
56.46	309.22	1377.64	54.51	309.0568	12.158	1.007	1044.516	581841.3	0.004263	
57.52	309.33	1371.41	54.42	309.1698	12.342	1.007	1044.52	590557.6	0.004192	
58.52	309.44	1369.04	54.51	309.2783	12.189	1.006	1044.523	583159.7	0.004256	
59.51	309.52	1341.06	53.38	309.3622	12.161	1.006	1044.532	581519.3	0.004177	
60.56	309.64	1357.99	54.21	309.4801	12.238	1.006	1044.537	585089.7	0.004215	
61.57	309.76	1366.8	54.76	309.5989	12.242	1.006	1044.541	585201.7	0.004257	
62.55	309.88	1373.64	55.25	309.7183	12.326	1.006	1044.543	589158.6	0.004266	

63.6	309.99	1363.9	55.01	309.8311	12.233	1.006	1044.547	584555.8	0.004279
64.66	310.09	1352.09	54.72	309.9348	12.234	1.006	1044.549	584572.3	0.004256
65.68	310.18	1334.76	54.14	310.0219	12.261	1.006	1044.553	585727.4	0.004202
66.66	310.28	1344.49	54.85	310.1239	12.266	1.006	1044.549	586118.6	0.004255
67.72	310.39	1342.51	55.03	310.2292	12.228	1.006	1044.547	584333.4	0.004283
68.7	310.5	1349.95	55.64	310.3355	12.266	1.006	1044.545	586237.7	0.004317
69.75	310.59	1329.88	55.07	310.426	12.156	1.006	1044.542	581046.4	0.004311
70.75	310.66	1315.06	54.63	310.5046	12.135	1.006	1044.542	580013.1	0.004284
71.8	310.73	1294.44	53.81	310.5749	12.099	1.006	1044.548	578151.6	0.004232
72.78	310.83	1309.58	54.71	310.6656	12.116	1.006	1044.545	579032.3	0.004297
73.78	310.91	1298.83	54.27	310.7454	12.166	1.006	1044.553	581203.9	0.004245
74.77	310.99	1299.8	54.5	310.8293	12.204	1.006	1044.553	583006.9	0.00425
75.76	311.08	1300.7	54.64	310.9162	12.142	1.005	1044.558	579953.1	0.004287
76.76	311.15	1286.55	54	310.9899	12.13	1.005	1044.568	579082.4	0.004241
77.75	311.23	1285.1	54.09	311.0678	12.238	1.005	1044.569	584188.3	0.00421
78.74	311.31	1282.71	54.11	311.1453	12.115	1.005	1044.572	578281.8	0.004255
79.79	311.4	1296.92	54.7	311.2446	12.091	1.005	1044.583	576809.4	0.004309
80.78	311.48	1284.7	54.28	311.3215	12.222	1.005	1044.587	582937.4	0.00423
81.83	311.56	1275.48	54.01	311.3989	12.277	1.005	1044.589	585486.3	0.004191
82.83	311.63	1269.72	53.85	311.4705	12.249	1.005	1044.593	584068.6	0.004188
83.82	311.71	1277.59	54.31	311.5529	12.326	1.004	1044.597	587625.7	0.004201
84.8	311.78	1264.57	53.7	311.6213	12.187	1.004	1044.607	580742.8	0.004201
85.86	311.87	1278.95	54.46	311.7143	12.335	1.004	1044.61	587692.4	0.00421
86.86	311.97	1289.46	55.08	311.8079	12.289	1.004	1044.612	585488	0.004274
87.84	312.04	1272.92	54.46	311.8797	12.217	1.004	1044.615	581926	0.00425
88.89	312.1	1251.54	53.57	311.9399	12.304	1.004	1044.621	585908.3	0.004151
89.89	312.18	1268.21	54.4	312.0222	12.195	1.004	1044.625	580646.8	0.004253
90.88	312.26	1266.92	54.48	312.1	12.311	1.004	1044.627	586110.1	0.004219
91.88	312.33	1260.81	54.3	312.1717	12.316	1.003	1044.63	586247.9	0.004208
92.87	312.4	1256.89	54.36	312.2415	12.295	1.004	1044.628	585308.3	0.004216
93.92	312.46	1241.52	53.78	312.3032	12.286	1.003	1044.63	584824.1	0.004178
94.97	312.53	1235.49	53.65	312.366	12.206	1.003	1044.631	580965.8	0.004195
96.02	312.6	1240.96	54.04	312.4394	12.253	1.003	1044.632	583196.9	0.004209
97.07	312.69	1257.13	54.95	312.5286	12.32	1.003	1044.632	586404.3	0.004257
98.12	312.76	1242.34	54.47	312.597	12.165	1.003	1044.632	579018.6	0.004273
99.11	312.81	1227.74	54.01	312.6509	12.155	1.004	1044.63	578614.4	0.004237
100.09	312.87	1231.02	54.34	312.7148	12.223	1.004	1044.628	581871.1	0.004239
101.08	312.93	1222.39	54.06		12.221	1.004	1044.63	581740.3	0.004218
102.06	312.99	1220.44	54.17		12.185	1.004	1044.627	580075.4	0.004239
103.05	313.05	1220.09	54.24		12.122	1.004	1044.63	577006.4	0.004266
104.03	313.1	1204.24	53.66		12.231	1.004	1044.63	582224.6	0.004183
105.02	313.16	1212.47	54.15		12.259	1.003	1044.631	583539.3	0.004216
106.02	313.23	1220.59	54.55		12.213	1.003	1044.637	581168.4	0.004263
107.01	313.3	1215.43	54.46		12.182	1.003	1044.637	579675.7	0.004267
108	313.36	1215	54.57		12.178	1.003	1044.638	579458.4	0.004277
108.99	313.42	1208.86	54.46		12.208	1.003	1044.638	580879.1	0.004258
109.98	313.48	1206.04	54.25		12.231	1.003	1044.648	581742.1	0.004233
110.97	313.53	1198.32	54.03		12.16	1.003	1044.648	578362.9	0.004241
112.03	313.53	1142.39	51.52		12.239	1.003	1044.648	582076.8	0.004018
113.07	313.54	1113.58	50.27		12.196	1.003	1044.645	580120.3	0.003934
114.06	313.53	1090.79	49.18		12.271	1.003	1044.648	583596.6	0.003825
115.05	313.53	1073.27	48.35		12.242	1.003	1044.65	582162.1	0.003769
116.05	313.53	1058.49	47.69		12.292	1.003	1044.65	584567.3	0.003703
117.04	313.54	1047.19	47.27		12.213	1.003	1044.645	580952.8	0.003694
118.02	313.54	1033.53	46.67		12.256	1.003	1044.645	582980.9	0.003634
119.01	313.53	1019.07	45.94		12.245	1.003	1044.649	582352.5	0.003581
120.07	313.53	1009.1	45.52		12.255	1.003	1044.647	582898.7	0.003545
121.07	313.53	993.15	44.61		12.25	1.003	1044.657	582362	0.003476
122.06	313.53	984.79	44.18		12.316	1.003	1044.659	585425.7	0.003424
123.07	313.53	977.1	43.86		12.302	1.003	1044.658	584826.9	0.003403
124.05	313.53	965.92	43.28		12.253	1.003	1044.663	582348.2	0.003371
125.1	313.53	958.53	42.96		12.332	1.003	1044.662	586148.6	0.003325
126.17	313.53	950.38	42.61		12.301	1.003	1044.661	584678.5	0.003306
127.18	313.52	938.11	41.92		12.335	1.002	1044.669	586109.3	0.003247

Erosion/Deposit #2 Panels, 1 blower

Delta time	Tcmiddle	Tcpanel	Tcin	Uinf	rho	Cp	mu	Pr	Time	Re
0	76.964	76.524	128123.3	1.243	1.153	1013.751	18.41	0.723	24.381	74109.53
1.001	76.975	76.486	92751.73	1.387	1.153	1013.739	18.409	0.723	25.382	82715.13
2.049	76.935	76.467	76.661	1.126	1.153	1013.733	18.409	0.723	26.43	67158.06
3.076	76.915	76.513	76.719	1.295	1.153	1013.748	18.41	0.723	27.457	77203.19
4.059	76.924	76.483	76.723	1.175	1.153	1013.738	18.409	0.723	28.44	70077.68
5.106	76.929	76.496	76.736	1.371	1.153	1013.742	18.41	0.723	29.487	81784.47
6.094	76.961	76.457	76.725	1.162	1.153	1013.729	18.409	0.723	30.475	69275.73
7.079	76.976	76.51	76.731	0.823	1.153	1013.747	18.41	0.723	31.46	49057.58
8.126	76.969	76.491	76.807	1.516	1.153	1013.74	18.41	0.723	32.507	90413.98
9.173	76.952	76.487	76.785	1.471	1.153	1013.739	18.409	0.723	33.554	87734.97
10.156	76.936	76.476	76.795	0.456	1.153	1013.736	18.409	0.723	34.537	27196.83
11.203	76.933	76.513	76.798	9.602	1.153	1013.748	18.41	0.723	35.584	572596.2
12.2	76.947	79.389	78.751	12.392	1.146	1014.73	18.485	0.724	36.581	731535.2
13.197	76.925	87.271	83.285	12.467	1.127	1017.892	18.689	0.727	37.578	715935.8
14.192	76.985	94.918	87.899	12.672	1.108	1021.776	18.885	0.73	38.573	708458.8
15.179	76.994	101.555	92.23	12.813	1.092	1025.979	19.053	0.734	39.56	699720.1
16.166	76.938	107.388	96.302	12.959	1.078	1030.457	19.197	0.738	40.547	693092
17.229	76.928	112.968	100.304	12.376	1.064	1035.554	19.333	0.743	41.61	648655
18.226	76.992	117.918	103.692	12.24	1.051	1040.85	19.452	0.749	42.607	629941.6
19.215	76.928	121.77	106.792	12.379	1.042	1043.404	19.543	0.751	43.596	628893.3
20.212	76.949	125.016	109.638	12.355	1.037	1043.564	19.621	0.75	44.593	621731.6
21.264	76.943	127.858	112.491	12.354	1.032	1043.709	19.689	0.75	45.645	616498.4
22.249	76.926	130.029	114.864	12.386	1.028	1043.822	19.741	0.75	46.63	614206.2
23.245	76.935	131.813	116.989	12.315	1.025	1043.917	19.784	0.749	47.626	607556.1
24.241	76.972	133.256	118.958	12.419	1.022	1043.995	19.818	0.749	48.622	610112.6
25.226	77	134.362	120.705	12.343	1.02	1044.056	19.845	0.749	49.607	604437.9
26.277	76.958	135.372	122.428	12.352	1.019	1044.112	19.869	0.749	50.658	603120.4
27.262	76.931	136.116	123.839	12.294	1.017	1044.153	19.886	0.749	51.643	599001.4
28.25	76.946	136.75	125.154	12.287	1.016	1044.189	19.901	0.749	52.631	597604.8
29.236	76.963	137.221	126.35	12.239	1.015	1044.215	19.913	0.749	53.617	594432.4
30.232	76.978	137.655	127.429	12.305	1.015	1044.24	19.923	0.749	54.613	596937.9
31.216	76.945	138.016	128.442	12.285	1.014	1044.261	19.932	0.749	55.597	595324.9
32.278	76.957	138.419	129.42	12.208	1.013	1044.284	19.941	0.749	56.659	590935.1
33.274	76.99	138.736	130.306	12.216	1.013	1044.302	19.949	0.749	57.655	590774.1
34.259	77.019	138.916	131.079	12.245	1.013	1044.312	19.953	0.749	58.64	591862.8
35.309	77.066	139.123	131.794	12.234	1.012	1044.324	19.958	0.749	59.69	590971.5
36.294	77.07	139.294	132.451	12.222	1.012	1044.334	19.962	0.748	60.675	590094.3
37.282	77.054	139.389	133.096	12.247	1.012	1044.339	19.964	0.748	61.663	591180.1
38.267	77.109	139.511	133.664	12.186	1.012	1044.347	19.967	0.748	62.648	588034.3
39.316	77.131	139.756	134.223	12.222	1.011	1044.361	19.973	0.748	63.697	589326.1
40.376	77.141	139.956	134.722	12.217	1.011	1044.372	19.978	0.748	64.757	588762.1
41.374	77.185	140.155	135.18	12.243	1.01	1044.384	19.982	0.748	65.755	589676.3
42.433	77.216	140.132	135.611	12.226	1.01	1044.383	19.982	0.748	66.814	588896.9
43.425	77.25	140.287	135.998	12.318	1.01	1044.392	19.985	0.748	67.806	593057.9
44.409	77.271	140.392	136.362	12.312	1.01	1044.398	19.988	0.748	68.79	592590.7
45.458	77.329	140.521	136.702	12.249	1.01	1044.405	19.991	0.748	69.839	589338.6
46.441	77.374	140.598	137.026	12.301	1.01	1044.41	19.993	0.748	70.822	591744.9
47.438	77.381	140.744	137.342	12.285	1.009	1044.418	19.996	0.748	71.819	590716.8
48.421	77.435	140.789	137.593	12.27	1.009	1044.421	19.997	0.748	72.802	589894.8
49.415	77.483	140.846	137.829	12.24	1.009	1044.424	19.999	0.748	73.796	588373.1
50.399	77.542	140.924	138.121	12.253	1.009	1044.429	20.001	0.748	74.78	588886.7
51.448	77.626	140.985	138.39	12.264	1.009	1044.432	20.002	0.748	75.829	589285.4
52.496	77.675	141	138.578	12.279	1.009	1044.433	20.002	0.748	76.877	590003
53.495	77.69	141.035	138.725	12.235	1.009	1044.435	20.003	0.748	77.876	587793.5
54.546	77.77	141.1	138.931	12.293	1.009	1044.439	20.005	0.748	78.927	590471.5
55.529	77.809	141.177	139.145	12.306	1.009	1044.444	20.007	0.748	79.91	590967.2
56.576	77.816	141.183	139.228	12.304	1.009	1044.444	20.007	0.748	80.957	590892.3
57.623	77.901	141.297	139.427	12.255	1.009	1044.451	20.009	0.748	82.004	588356.5
58.673	77.936	141.361	139.537	12.304	1.008	1044.455	20.011	0.748	83.054	590590.8
59.721	77.978	141.457	139.687	12.271	1.008	1044.46	20.013	0.748	84.102	588828.8

60.789	78.012	141.519	139.843	12.255	1.008	1044.464	20.015	0.748	85.17	587987.8
61.839	78.089	141.641	139.989	12.267	1.008	1044.471	20.018	0.748	86.22	588330.1
62.885	78.18	141.762	140.114	12.258	1.008	1044.478	20.02	0.748	87.266	587678.3
63.869	78.234	141.807	140.221	12.259	1.008	1044.481	20.022	0.748	88.25	587656.4
64.917	78.291	141.842	140.34	12.261	1.008	1044.483	20.022	0.748	89.298	587693.8
65.899	78.343	141.904	140.488	12.332	1.007	1044.487	20.024	0.748	90.28	591000.7
66.946	78.442	142.008	140.573	12.285	1.007	1044.493	20.026	0.748	91.327	588562.4
67.936	78.446	141.975	140.673	12.292	1.007	1044.491	20.025	0.748	92.317	588980.8
68.983	78.564	142.025	140.726	12.285	1.007	1044.494	20.027	0.748	93.364	588538.8
70.032	78.594	142.12	140.858	12.247	1.007	1044.5	20.029	0.748	94.413	586580.4
71.09	78.704	142.099	140.933	12.268	1.007	1044.498	20.028	0.748	95.471	587640.1
72.09	78.729	142.112	140.972	12.246	1.007	1044.499	20.029	0.748	96.471	586532.4
73.075	78.87	142.165	141.081	12.239	1.007	1044.502	20.03	0.748	97.456	586129.9
74.134	78.907	142.306	141.217	12.3	1.007	1044.511	20.033	0.748	98.515	588806.4
75.128	78.905	142.335	141.265	12.323	1.007	1044.512	20.034	0.748	99.509	589840.2
76.118	79.009	142.406	141.332	12.237	1.007	1044.516	20.036	0.748	100.499	585624.8
77.176	79.081	142.436	141.432	12.295	1.007	1044.518	20.036	0.748	101.557	588353.3
78.17	79.156	142.502	141.497	12.179	1.006	1044.522	20.038	0.748	102.551	582695.5
79.165	79.207	142.558	141.58	12.317	1.006	1044.526	20.039	0.748	103.546	589189.4
80.148	79.239	142.583	141.588	12.209	1.006	1044.527	20.04	0.748	104.529	583964.4
81.132	79.333	142.524	141.631	12.289	1.006	1044.524	20.039	0.748	105.513	587904.2
82.117	79.434	142.523	141.638	12.246	1.006	1044.523	20.038	0.748	106.498	585855.4
83.164	79.49	142.544	141.686	12.23	1.006	1044.525	20.039	0.748	107.545	585042.1
84.146	79.545	142.5	141.67	12.266	1.006	1044.522	20.038	0.748	108.527	586837.1
85.193	79.607	142.491	141.71	12.259	1.007	1044.522	20.038	0.748	109.574	586553.5
86.175	79.709	142.532	141.714	12.315	1.006	1044.524	20.039	0.748	110.556	589160
87.224	79.802	142.521	141.766	12.257	1.006	1044.523	20.038	0.748	111.605	586376.3
88.209	79.858	142.555	141.788	12.286	1.006	1044.525	20.039	0.748	112.59	587709.9
89.257	79.906	142.562	141.836	12.245	1.006	1044.526	20.039	0.748	113.638	585744.6
90.305	79.996	142.594	141.872	12.204	1.006	1044.528	20.04	0.748	114.686	583717.3
91.289	80.1	142.596	141.942	12.275	1.006	1044.528	20.04	0.748	115.67	587125.4
92.335	80.165	142.607	141.892	12.285	1.006	1044.529	20.04	0.748	116.716	587601.9
93.318	80.225	142.655	141.973	12.228	1.006	1044.531	20.042	0.748	117.699	584770.6
94.3	80.297	142.679	141.965	12.27	1.006	1044.533	20.042	0.748	118.681	586762.2
95.283	80.425	142.711	142.004	12.218	1.006	1044.535	20.043	0.748	119.664	584190.6
96.267	80.423	142.784	142.073	12.283	1.006	1044.539	20.045	0.748	120.648	587189.2
97.316	80.537	142.758	142.13	12.291	1.006	1044.537	20.044	0.748	121.697	587631.5
98.373	80.561	142.841	142.18	12.326	1.006	1044.542	20.046	0.748	122.754	589150.9
99.366	80.653	142.953	142.168	12.268	1.006	1044.549	20.049	0.748	123.747	586213.7
100.416	80.744	142.858	142.256	12.284	1.006	1044.543	20.046	0.748	124.797	587114.7
101.467	80.83	142.913	142.268	12.272	1.006	1044.547	20.048	0.748	125.848	586427.9
102.517	80.876	142.902	142.273	12.266	1.006	1044.546	20.047	0.748	126.898	586198.8
103.577	80.992	142.923	142.309	12.319	1.006	1044.547	20.048	0.748	127.958	588685.7
104.569	80.986	142.911	142.265	12.298	1.006	1044.547	20.048	0.748	128.95	587695.4
105.552	81.051	142.928	142.269	12.292	1.006	1044.548	20.048	0.748	129.933	587377.3
106.544	81.176	142.891	142.31	12.296	1.006	1044.546	20.047	0.748	130.925	587652.3
107.538	81.257	142.887	142.323	12.305	1.006	1044.545	20.047	0.748	131.919	588050.6
108.524	81.275	142.931	142.31	12.364	1.006	1044.548	20.048	0.748	132.905	590827.3
109.507	81.347	142.925	142.295	12.296	1.006	1044.547	20.048	0.748	133.888	587596.3
110.551	81.423	142.924	142.339	12.301	1.006	1044.547	20.048	0.748	134.932	587806.6
111.536	81.491	142.978	142.36	12.368	1.006	1044.551	20.049	0.748	135.917	590944.8
112.534	81.577	142.93	142.325	12.258	1.006	1044.548	20.048	0.748	136.915	585746.4
113.535	81.693	142.947	142.315	12.302	1.006	1044.549	20.049	0.748	137.916	587822.7
114.519	81.717	142.921	142.315	12.573	1.006	1044.547	20.048	0.748	138.9	600822.7
115.501	81.767	142.839	142.321	12.748	1.006	1044.542	20.046	0.748	139.882	609306.8
116.56	81.899	142.799	142.293	12.911	1.006	1044.54	20.045	0.748	140.941	617174.1
117.555	81.996	142.707	142.332	12.973	1.006	1044.534	20.043	0.748	141.936	620336.2
118.54	82.009	142.75	142.358	13.026	1.006	1044.537	20.044	0.748	142.921	622782.6
119.523	82.111	142.747	142.422	13.033	1.006	1044.537	20.044	0.748	143.904	623117.6

time adjustment		1 second							
IR data		IRT, amb=76.5	IRT, amb=142	TC time	IR Temp, ε	IR Temp, ε	IR Temp a	Poly fit	
IR time	ltimeadj								
0	1	76.2494	71.231	0	76.25	71.23	76.25	76.2763	
0.99	1.9900004	76.244	71.2238	1.001	76.25	71.23	76.25223	76.27835	
2.431	3.4310004	76.2494	71.231	2.049	76.24	71.22	76.24334	76.27015	
3.431	4.431	76.2566	71.2364	3.076	76.25	71.23	76.25064	76.27689	
4.13	5.1300005	76.2404	71.2202	4.059	76.25	71.23	76.2524	76.27851	
5.13	6.1300001	76.2458	71.2274	5.106	76.24	71.22	76.24164	76.26858	
6.331	7.331	76.2368	71.2166	6.094	76.25	71.23	76.25393	76.27992	
7.031	8.031	76.2332	71.213	7.079	76.24	71.22	76.24082	76.26783	
8.071	9.0710002	76.2476	71.2274	8.126	76.23	71.21	76.23193	76.25963	
9.24	10.24	76.2692	71.2508	9.173	76.25	71.23	76.25217	76.2783	
10.401	11.401	76.2674	71.249	10.156	76.27	71.25	76.27281	76.29734	
11.61	12.61	77.2754	72.2984	11.203	76.27	71.25	76.27064	76.29534	
12.311	13.311001	78.2402	73.2992	12.2	76.93	71.94	76.76214	76.7489	
13.34	14.34	79.8224	74.9444	13.197	78.08	73.14	77.45033	77.38431	
14.551	15.551	81.5414	76.7282	14.192	79.59	74.71	78.5123	78.36564	
15.74	16.74	83.1776	78.4256	15.179	81.01	76.18	79.54344	79.3194	
16.941	17.941	84.479	79.7774	16.166	82.39	77.61	80.58168	80.28067	
17.71	18.71	85.2692	80.5964	17.229	83.71	78.98	81.57475	81.20097	
18.791	19.791	86.3582	81.7232	18.226	84.77	80.08	82.34473	81.91511	
20.01	21.01	87.5678	82.976	19.215	85.78	81.12	83.12904	82.64308	
21.281	22.281	88.6946	84.1424	20.212	86.78	82.16	83.93886	83.39527	
22.551	23.551	89.6432	85.1234	21.264	87.79	83.21	84.78235	84.17933	
23.801	24.801001	90.5234	86.0342	22.249	88.67	84.11	85.53515	84.87961	
25.35	26.35	91.5044	87.0494	23.245	89.41	84.89	86.17062	85.47113	
26.551	27.551	92.2514	87.8198	24.241	90.13	85.63	86.80608	86.06298	
27.651	28.651	92.849	88.4372	25.226	90.79	86.31	87.40128	86.61766	
28.39	29.39	93.2558	88.8584	26.277	91.46	87	88.0121	87.18721	
29.521	30.521	93.821	89.4434	27.262	92.07	87.63	88.57851	87.71563	
30.76	31.76	94.4186	90.059	28.25	92.63	88.21	89.10136	88.20366	
32.031	33.031	95.0162	90.6764	29.236	93.17	88.77	89.61377	88.68217	
33.34	34.34	95.5112	91.1876	30.232	93.68	89.29	90.09834	89.13489	
34.6	35.6	96.0422	91.7366	31.216	94.16	89.79	90.55719	89.56377	
35.87	36.87	96.5678	92.2784	32.278	94.66	90.31	91.03358	90.00923	
37.13	38.13	96.9998	92.7248	33.274	95.11	90.77	91.465	90.41282	
38.411	39.411	97.4768	93.2162	34.259	95.48	91.16	91.82446	90.7492	
39.701	40.701	97.8944	93.6464	35.309	95.92	91.61	92.25233	91.14976	
40.98	41.980001	98.276	94.0406	36.294	96.33	92.03	92.65231	91.52434	
42.271	43.271	98.6828	94.46	37.282	96.71	92.42	93.02674	91.87513	
43.87	44.87	99.1976	94.991	38.267	97.05	92.78	93.3596	92.18706	
45.11	46.11	99.5702	95.3744	39.316	97.44	93.18	93.73524	92.53921	
46.24	47.24	99.869	95.6822	40.376	97.79	93.54	94.07352	92.85644	
47.571	48.571	100.229	96.0548	41.374	98.1	93.85	94.37187	93.13629	
48.85	49.85	100.5404	96.3752	42.433	98.42	94.19	94.69321	93.43781	
49.59	50.59	100.7438	96.584	43.425	98.73	94.51	94.99413	93.72024	
50.71	51.71	101.0498	96.9008	44.409	99.05	94.84	95.30798	94.01489	
52.01	53.01	101.345	97.205	45.458	99.37	95.17	95.62042	94.3083	
53.311	54.311	101.642	97.511	46.441	99.66	95.46	95.90591	94.57648	
54.62	55.62	101.9714	97.8512	47.438	99.92	95.74	96.15736	94.81274	
55.88	56.88	102.263	98.1518	48.421	100.19	96.01	96.42472	95.06401	
57.161	58.161001	102.5492	98.4452	49.415	100.43	96.27	96.66138	95.28647	
58.421	59.421001	102.8174	98.7224	50.399	100.69	96.53	96.91681	95.52664	
59.75	60.75	103.154	99.0698	51.448	100.98	96.83	97.20324	95.79601	
61.421	62.421001	103.4924	99.4172	52.496	101.23	97.08	97.45236	96.03036	
62.62	63.62	103.739	99.671	53.495	101.46	97.32	97.68031	96.24484	
63.39	64.39	103.8758	99.8114	54.546	101.7	97.57	97.9165	96.46712	
64.561	65.561	104.108	100.0508	55.529	101.95	97.83	98.16199	96.69821	
65.86	66.86	104.333	100.283	56.576	102.19	98.08	98.40163	96.92384	
67.161	68.161	104.5796	100.5368	57.623	102.43	98.32	98.63496	97.14356	
68.5	69.500001	104.8316	100.796	58.673	102.66	98.56	98.86121	97.35667	
69.771	70.771001	105.0584	101.03	59.721	102.89	98.8	99.08558	97.56806	

71.061	72.061001	105.278	101.255	60.789	103.16	99.08	99.35195	97.81907
72.63	73.63	105.5498	101.534	61.839	103.37	99.3	99.5548	98.01026
73.431	74.431	105.701	101.6906	62.885	103.59	99.52	99.76771	98.21097
74.701	75.701	105.9134	101.9084	63.869	103.78	99.72	99.95507	98.38764
75.541	76.541	106.0502	102.0506	64.917	103.98	99.92	100.153	98.57431
76.771	77.771	106.2518	102.2576	65.899	104.17	100.11	100.3394	98.7501
78.14	79.14	106.4534	102.4664	66.946	104.35	100.3	100.5133	98.91415
79.541	80.541	106.6694	102.6878	67.936	104.54	100.49	100.7052	99.09525
80.911	81.911001	106.9016	102.9254	68.983	104.73	100.7	100.8923	99.27178
82.311	83.311001	107.0546	103.0838	70.032	104.93	100.89	101.0867	99.4553
83.14	84.140001	107.2058	103.2404	71.09	105.11	101.09	101.268	99.62638
84.34	85.34	107.3714	103.4096	72.09	105.28	101.26	101.4372	99.78617
86.01	87.01	107.6342	103.6796	73.075	105.45	101.44	101.6041	99.94377
87.411	88.411001	107.7746	103.8236	74.134	105.64	101.63	101.7858	100.1154
88.681	89.681	107.978	104.0324	75.128	105.82	101.81	101.9641	100.2838
89.521	90.521	108.1112	104.171	76.118	105.98	101.98	102.12	100.4311
90.75	91.75	108.2588	104.3222	77.176	106.15	102.16	102.2882	100.59
92.09	93.09	108.4316	104.5004	78.17	106.31	102.32	102.4444	100.7376
93.49	94.49	108.5846	104.657	79.165	106.46	102.47	102.5911	100.8763
94.89	95.89	108.7916	104.8694	80.148	106.61	102.63	102.7396	101.0167
96.291	97.291	108.9266	105.008	81.132	106.77	102.79	102.9031	101.1712
98	99	109.1966	105.287	82.117	106.92	102.95	103.0531	101.3131
99.331	100.331	109.3712	105.467	83.164	107.04	103.07	103.1719	101.4254
100.561	101.561	109.49	105.5876	84.146	107.21	103.24	103.3445	101.5886
101.431	102.431	109.5854	105.6848	85.193	107.35	103.39	103.485	101.7216
102.63	103.63	109.7312	105.836	86.175	107.5	103.54	103.6326	101.8612
104	105	109.8392	105.9476	87.224	107.66	103.7	103.7932	102.0132
105.37	106.37	109.9814	106.0934	88.209	107.75	103.8	103.8812	102.0965
106.801	107.801	110.2046	106.322	89.257	107.91	103.96	104.0408	102.2475
				90.305	108.08	104.14	104.209	102.4067
				91.289	108.2	104.27	104.3288	102.5202
				92.335	108.33	104.4	104.4582	102.6426
				93.318	108.46	104.53	104.5854	102.7631
				94.3	108.56	104.64	104.684	102.8564
				95.283	108.7	104.78	104.8221	102.9872
				96.267	108.83	104.91	104.9478	103.1063
				97.316	108.93	105.01	105.0494	103.2025
				98.373	109.1	105.18	105.2145	103.359
				99.366	109.24	105.34	105.3479	103.4854
				100.416	109.38	105.48	105.4935	103.6233
				101.467	109.48	105.58	105.5903	103.7151
				102.517	109.6	105.7	105.7109	103.8294
				103.577	109.72	105.83	105.8297	103.942
				104.569	109.81	105.91	105.9204	104.028
				105.552	109.9	106.01	106.0094	104.1124
				106.544	110.01	106.12	106.1216	104.2187
				107.538	110.16	106.28	106.2718	104.3612
				108.524	110.2	106.32	106.3092	104.3967
				109.507	110.2	106.32	106.3096	104.397
				110.551	110.2	106.32	106.3096	104.3971
				111.536	110.2	106.32	106.3065	104.3941
				112.534	110.2	106.32	106.3093	104.3968
				113.535	110.2	106.32	106.3083	104.3958
				114.519	110.2	106.32	106.3098	104.3973
				115.501	110.2	106.32	106.3146	104.4018
				116.56	110.2	106.32	106.317	104.404
				117.555	110.2	106.32	106.3223	104.4092
				118.54	110.2	106.32	106.3198	104.4068
				119.523	110.2	106.32	106.32	104.4069

TCTime	Twall	q	h	T(K)	Velocity	density	cp	Rex	St
0	297.76	0	0	297.5979	1.243	1.153	1013.751	74109.53	0
1	297.76	1.19	10.29	297.5991	1.387	1.153	1013.739	82715.13	0.006347
2.05	297.75	-4.15	-37.93	297.5945	1.126	1.153	1013.733	67158.06	-0.02882
3.08	297.76	2.29	17.43	297.5983	1.295	1.153	1013.748	77203.19	0.011515
4.06	297.76	1.38	12.17	297.5992	1.175	1.153	1013.738	70077.68	0.008861
5.11	297.75	-4.98	-39.41	297.5937	1.371	1.153	1013.742	81784.47	-0.02459
6.09	297.76	4.7	47.77	297.6	1.162	1.153	1013.729	69275.73	0.035172
7.08	297.75	-5.74	-42.7	297.5932	0.823	1.153	1013.747	49057.58	-0.04439
8.13	297.75	-6.61	-51.41	297.5887	1.516	1.153	1013.74	90413.98	-0.02901
9.17	297.76	7.14	61.62	297.5991	1.471	1.153	1013.739	87734.97	0.035839
10.16	297.77	12.83	129.24	297.6096	0.456	1.153	1013.736	27196.83	0.242481
11.2	297.77	4.41	36.43	297.6085	9.602	1.153	1013.748	572596.2	0.003246
12.2	298.02	266.48	181.68	297.8605	12.392	1.146	1014.73	731535.2	0.012608
13.2	298.37	480.07	87.4	298.2135	12.467	1.127	1017.892	715935.8	0.006111
14.19	298.92	807.9	87.86	298.7587	12.672	1.108	1021.776	708458.8	0.006124
15.18	299.45	981.93	79.49	299.2886	12.813	1.092	1025.979	699720.1	0.005537
16.17	299.98	1134.48	75.33	299.8226	12.959	1.078	1030.457	693092	0.005233
17.23	300.49	1211.56	68.65	300.3339	12.376	1.064	1035.554	648655	0.005034
18.23	300.89	1219.24	60.96	300.7306	12.24	1.051	1040.85	629941.6	0.004553
19.22	301.3	1284.45	59.09	301.135	12.379	1.042	1043.404	628893.3	0.00439
20.21	301.71	1357.84	58.72	301.5529	12.355	1.037	1043.564	621731.6	0.004392
21.26	302.15	1422.11	58.61	301.9885	12.354	1.032	1043.709	616498.4	0.004405
22.25	302.54	1462.9	58.32	302.3776	12.386	1.028	1043.822	614206.2	0.004368
23.25	302.87	1446.49	56.18	302.7062	12.315	1.025	1043.917	607556.1	0.004263
24.24	303.19	1469.96	56.07	303.035	12.419	1.022	1043.995	610112.6	0.004232
25.23	303.5	1480.87	55.83	303.3431	12.343	1.02	1044.056	604437.9	0.004247
26.28	303.82	1493.68	55.8	303.6596	12.352	1.019	1044.112	603120.4	0.004246
27.26	304.11	1512.2	56.24	303.9531	12.294	1.017	1044.153	599001.4	0.004308
28.25	304.38	1510.57	56.01	304.2243	12.287	1.016	1044.189	597604.8	0.004297
29.24	304.65	1519.77	56.36	304.4901	12.239	1.015	1044.215	594432.4	0.004345
30.23	304.9	1517.48	56.3	304.7416	12.305	1.015	1044.24	596937.9	0.004317
31.22	305.14	1516.89	56.35	304.9799	12.285	1.014	1044.261	595324.9	0.004332
32.28	305.39	1516.55	56.39	305.2274	12.208	1.013	1044.284	590935.1	0.004366
33.27	305.61	1516.1	56.47	305.4516	12.216	1.013	1044.302	590774.1	0.00437
34.26	305.8	1486.24	55.54	305.6384	12.245	1.013	1044.312	591862.8	0.004288
35.31	306.02	1503.56	56.41	305.861	12.234	1.012	1044.324	590971.5	0.004363
36.29	306.23	1511.16	56.94	306.0691	12.222	1.012	1044.334	590094.3	0.004408
37.28	306.42	1505.3	57.03	306.264	12.247	1.012	1044.339	591180.1	0.004406
38.27	306.6	1486.71	56.55	306.4373	12.186	1.012	1044.347	588034.3	0.004391
39.32	306.79	1494.24	56.96	306.6329	12.222	1.011	1044.361	589326.1	0.004414
40.38	306.97	1477.23	56.46	306.8091	12.217	1.011	1044.372	588762.1	0.004377
41.37	307.12	1463.2	56.01	306.9646	12.243	1.01	1044.384	589676.3	0.004337
42.43	307.29	1460.65	56.31	307.1321	12.226	1.01	1044.383	588896.9	0.004366
43.42	307.45	1459.6	56.42	307.289	12.318	1.01	1044.392	593057.9	0.004342
44.41	307.61	1468.46	56.99	307.4527	12.312	1.01	1044.398	592590.7	0.004388
45.46	307.78	1462.09	56.95	307.6157	12.249	1.01	1044.405	589338.6	0.004408
46.44	307.92	1458.59	57.05	307.7647	12.301	1.01	1044.41	591744.9	0.004397
47.44	308.06	1438.03	56.36	307.896	12.285	1.009	1044.418	590716.8	0.004353
48.42	308.2	1441.63	56.75	308.0356	12.27	1.009	1044.421	589894.8	0.004389
49.41	308.32	1423.4	56.24	308.1592	12.24	1.009	1044.424	588373.1	0.00436
50.4	308.45	1428.24	56.63	308.2926	12.253	1.009	1044.429	588886.7	0.004386
51.45	308.6	1436.2	57.21	308.4422	12.264	1.009	1044.432	589285.4	0.004427
52.5	308.73	1420.5	56.86	308.5724	12.279	1.009	1044.433	590003	0.004394
53.49	308.85	1411.09	56.71	308.6916	12.235	1.009	1044.435	587793.5	0.004398
54.55	308.98	1404.49	56.64	308.8151	12.293	1.009	1044.439	590471.5	0.004372
55.53	309.1	1414.46	57.24	308.9434	12.306	1.009	1044.444	590967.2	0.004414
56.58	309.23	1406.28	57.19	309.0688	12.304	1.009	1044.444	590892.3	0.004411
57.62	309.35	1401.06	57.12	309.1909	12.255	1.009	1044.451	588356.5	0.004423
58.67	309.47	1394.81	57.05	309.3093	12.304	1.008	1044.455	590590.8	0.004404
59.72	309.59	1391.26	57.06	309.4267	12.271	1.008	1044.46	588828.8	0.004417

60.79	309.73	1409.13	58.04	309.5661	12.255	1.008	1044.464	587987.8	0.004498
61.84	309.83	1384.69	57.13	309.6724	12.267	1.008	1044.471	588330.1	0.004424
62.88	309.94	1383.18	57.17	309.7839	12.258	1.008	1044.478	587678.3	0.004443
63.87	310.04	1373.83	56.95	309.882	12.259	1.008	1044.481	587656.4	0.004412
64.92	310.15	1368.26	56.92	309.9857	12.261	1.008	1044.483	587693.8	0.004409
65.9	310.24	1365.25	56.95	310.0834	12.332	1.007	1044.487	591000.7	0.004391
66.95	310.33	1349.46	56.37	310.1745	12.285	1.007	1044.493	588562.4	0.004363
67.94	310.44	1357.48	56.98	310.2751	12.292	1.007	1044.491	588980.8	0.004407
68.98	310.53	1349.88	56.83	310.3732	12.285	1.007	1044.494	588538.8	0.004398
70.03	310.64	1350.53	56.98	310.4752	12.247	1.007	1044.5	586580.4	0.004423
71.09	310.73	1341.92	56.87	310.5702	12.268	1.007	1044.498	587640.1	0.004407
72.09	310.82	1337.19	56.87	310.659	12.246	1.007	1044.499	586532.4	0.004415
73.08	310.91	1334.18	56.88	310.7465	12.239	1.007	1044.502	586129.9	0.004419
74.13	311	1332.86	56.86	310.8419	12.3	1.007	1044.511	588806.4	0.004395
75.13	311.1	1335.68	57.17	310.9355	12.323	1.007	1044.512	589840.2	0.004411
76.12	311.18	1324.35	56.79	311.0173	12.237	1.007	1044.516	585624.8	0.004412
77.18	311.27	1320.52	56.8	311.1056	12.295	1.007	1044.518	588353.3	0.004392
78.17	311.35	1316.56	56.74	311.1876	12.179	1.006	1044.522	582695.5	0.004434
79.17	311.42	1308.55	56.51	311.2646	12.317	1.006	1044.526	589189.4	0.004366
80.15	311.5	1306.17	56.56	311.3426	12.209	1.006	1044.527	583964.4	0.004409
81.13	311.59	1311.66	57.09	311.4285	12.289	1.006	1044.524	587904.2	0.004421
82.12	311.67	1305.3	57.01	311.5073	12.246	1.006	1044.523	585855.4	0.004443
83.16	311.73	1280.95	56.07	311.5697	12.23	1.006	1044.525	585042.1	0.004363
84.15	311.82	1304.38	57.39	311.6604	12.266	1.006	1044.522	586837.1	0.004453
85.19	311.89	1287.36	56.84	311.7342	12.259	1.007	1044.522	586553.5	0.004408
86.17	311.97	1290.84	57.13	311.8118	12.315	1.006	1044.524	589160	0.004415
87.22	312.06	1292.07	57.41	311.8962	12.257	1.006	1044.523	586376.3	0.004457
88.21	312.1	1257.54	55.95	311.9425	12.286	1.006	1044.525	587709.9	0.004334
89.26	312.19	1277.7	57.05	312.0264	12.245	1.006	1044.526	585744.6	0.004434
90.31	312.27	1285.42	57.57	312.1148	12.204	1.006	1044.528	583717.3	0.004489
91.29	312.34	1267.82	56.94	312.1779	12.275	1.006	1044.528	587125.4	0.004414
92.33	312.41	1262.32	56.86	312.2459	12.285	1.006	1044.529	587601.9	0.004405
93.32	312.47	1261.3	56.91	312.3128	12.228	1.006	1044.531	584770.6	0.004429
94.3	312.52	1243.42	56.2	312.3647	12.27	1.006	1044.533	586762.2	0.004359
95.28	312.6	1256.7	56.94	312.4374	12.218	1.006	1044.535	584190.6	0.004435
96.27	312.66	1252.03	56.8	312.5035	12.283	1.006	1044.539	587189.2	0.004401
97.32	312.72	1232.79	56.1	312.5569	12.291	1.006	1044.537	587631.5	0.004344
98.37	312.8	1257.45	57.33	312.6439	12.326	1.006	1044.542	589150.9	0.004426
99.37	312.87	1252.1	57.1	312.7141	12.268	1.006	1044.549	586213.7	0.004429
100.42	312.95	1254.09	57.53	312.7907	12.284	1.006	1044.543	587114.7	0.004457
101.47	313	1228.76	56.43		12.272	1.006	1044.547	586427.9	0.004376
102.52	313.07	1231.42	56.73		12.266	1.006	1044.546	586198.8	0.004401
103.58	313.13	1227.39	56.68		12.319	1.006	1044.547	588685.7	0.004379
104.57	313.18	1213.29	56.17		12.298	1.006	1044.547	587695.4	0.004347
105.55	313.22	1205.66	55.91		12.292	1.006	1044.548	587377.3	0.004329
106.54	313.28	1211.9	56.41		12.296	1.006	1044.546	587652.3	0.004366
107.54	313.36	1232.57	57.59		12.305	1.006	1044.545	588050.6	0.004454
108.52	313.38	1178.73	55.06		12.364	1.006	1044.548	590827.3	0.004238
109.51	313.38	1138.43	53.19		12.296	1.006	1044.547	587596.3	0.004117
110.55	313.38	1113.51	52.02		12.301	1.006	1044.547	587806.6	0.004024
111.54	313.38	1092.75	50.98		12.368	1.006	1044.551	590944.8	0.003923
112.53	313.38	1078.63	50.39		12.258	1.006	1044.548	585746.4	0.003912
113.54	313.38	1062.37	49.6		12.302	1.006	1044.549	587822.7	0.003837
114.52	313.38	1050.03	49.06		12.573	1.006	1044.547	600822.7	0.003713
115.5	313.38	1039.82	48.69		12.748	1.006	1044.542	609306.8	0.003635
116.56	313.38	1026.94	48.14		12.911	1.006	1044.54	617174.1	0.003548
117.56	313.39	1017.91	47.84		12.973	1.006	1044.534	620336.2	0.003509
118.54	313.39	1004.22	47.14		13.026	1.006	1044.537	622782.6	0.003444
119.52	313.39	994.91	46.71		13.033	1.006	1044.537	623117.6	0.003411

APPENDIX G

Convective Heat Transfer Coefficient Calculations

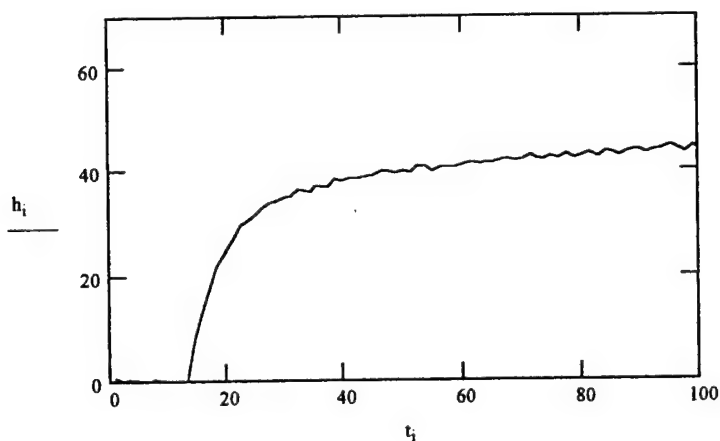
Flat panels, 1 blower 06 Feb 01

Thermal diffusivity $\alpha := 0.000000058 \text{ m}^2/\text{s}$
 Thermal conductivity $k := .226 \text{ W/mK}$
 Prandtl number (for air) $Pr := 0.78$
 Dist from splitter plate to temp meas area $x := .9652 \text{ m}$
 Specific (heat for air) $C_p := 1070.2 \text{ J/kgK}$
 Density of air $\rho := 0.986 \text{ kg/m}^3$
 Velocity of flow $U_{inf} := 12.95 \text{ m/s}$
 Temperature of airflow $T_{inf} := 334.1 \text{ K}$

Total number of data points $N := 87$
 $i := 1, 2 \dots N$

$$q_i := \frac{2k}{\sqrt{\pi \cdot \alpha}} \cdot \sum_{j=1}^i \frac{(T_j - T_{j-1})}{\sqrt{t_i - t_j} + \sqrt{t_i - t_{j-1}}}$$

$$h_i := \frac{q_i}{T_{inf} - T_i}$$



$$h_{avg} := \sum_{i=30}^{50} \frac{h_i}{21} \quad h_{avg} = 38.717$$

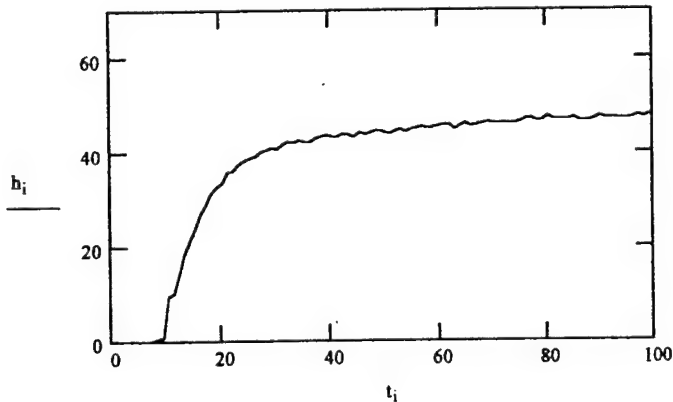
302.43	40.95
302.61	42.14
302.72	42.87
302.88	43.94
303.06	45.18
303.29	46.68
303.45	47.84
303.58	48.91
303.74	50.11
303.88	51.33
304.06	52.55
304.21	53.75
304.33	54.99
304.49	56.32
304.64	57.66
304.77	58.87
304.91	60.09
305.05	61.29
305.18	62.5
305.25	63.23
305.36	64.26
305.48	65.5
305.61	66.73
305.74	67.98
305.85	69.2
306	70.77
306.12	71.87
306.19	72.71
306.28	73.85
306.4	75.11
306.5	76.34
306.63	77.65
306.72	78.91
306.83	80.21
306.95	81.49
307.06	83.08
307.18	84.35
307.27	85.48

Pitted panels, 1 blower 08 Feb 01

Thermal diffusivity $\alpha := 0.000000058 \text{ m}^2/\text{s}$
 Thermal conductivity $k := .226 \text{ W/mK}$
 Prandtl number (for air) $Pr := 0.78$
 Dist from splitter plate to temp meas area $x := .9652 \text{ m}$
 Specific (heat for air) $C_p := 1051.3 \text{ J/kgK}$
 Density of air $\rho := 1.003 \text{ kg/m}^3$
 Velocity of flow $U_{inf} := 12.6 \text{ m/s}$
 Temperature of airflow $T_{inf} := 335.2 \text{ K}$

Total number of data points $N := 99$
 $i := 1, 2 \dots N$

$$q_i := \frac{2k}{\sqrt{\pi \cdot \alpha}} \sum_{j=1}^i \frac{(T_j - T_{j-1})}{\sqrt{t_i - t_j} + \sqrt{t_i - t_{j-1}}} \quad h_i := \frac{q_i}{T_{inf} - T_i}$$



$$h_{avg} := \sum_{i=30}^{50} \frac{h_i}{21} \quad h_{avg} = 43.182$$

304.653264	38.62
304.817203	39.6
304.965422	40.6
305.104228	41.59
305.266639	42.64
305.413442	43.68
305.534380	44.68
305.683789	45.69
305.808859	46.7
305.940162	47.7
306.075320	48.7
306.231111	49.99
306.337609	50.99
306.466054	52.05
306.591955	53.05
306.691648	54.03
306.807618	55.02
306.923140	56
307.040446	56.99
307.143452	57.98
307.247200	58.98
307.363284	60.03
307.479170	61.09
307.579931	62.07
307.661533	63.12
307.761603	64.11
307.872666	65.16
307.964122	66.21
308.061823	67.26
308.164259	68.33
308.267532	69.39
308.353764	70.38
308.438687	71.39
308.529763	72.44
308.611595	73.42
308.695863	74.47
308.783987	75.47
308.880252	76.47
...	...

Fuel panels, 1 blower 08 Feb 01

Thermal diffusivity

$$\alpha := 0.000000058 \text{ m}^2/\text{s}$$

Thermal conductivity

$$k := .226 \text{ W/mK}$$

Prandtl number (for air)

$$\text{Pr} := 0.78$$

Dist from splitter plate to temp meas area $x := .9652 \text{ m}$

Specific (heat for air)

$$C_p := 1044.6 \text{ J/kgK}$$

Density of air

$$\rho := 1.006 \text{ kg/m}^3$$

Velocity of flow

$$U_{\text{inf}} := 12.2 \text{ m/s}$$

Temperature of airflow

$$T_{\text{inf}} := 335.2 \text{ K}$$

Total number of data points

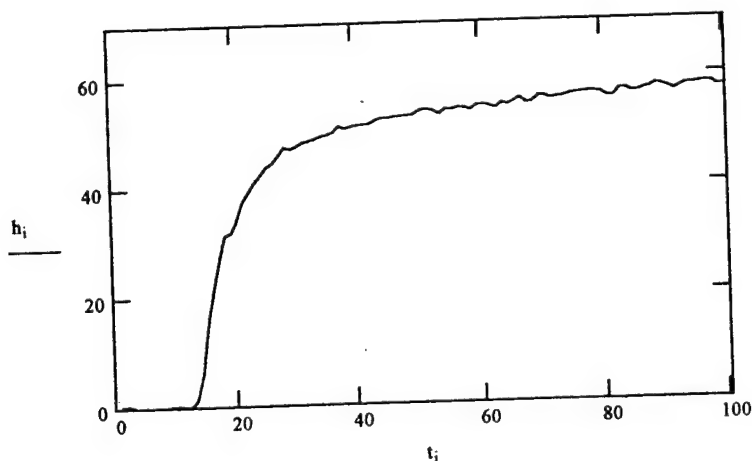
$$N := 99$$

$$i := 1, 2 \dots N$$

$$T :=$$

$$q_i := \frac{2k}{\sqrt{\pi \cdot \alpha}} \sum_{j=1}^i \frac{(T_j - T_{j-1})}{\sqrt{t_i - t_j} + \sqrt{t_i - t_{j-1}}}$$

$$h_i := \frac{q_i}{T_{\text{inf}} - T_i}$$



$$\text{havg} := \sum_{i=30}^{50} \frac{h_i}{21} \quad \text{havg} = 51.023$$

305.2760921	38.38
305.4734377	39.38
305.6596423	40.37
305.8369688	41.35
306.0099266	42.34
306.1995182	43.39
306.3763902	44.39
306.5423399	45.39
306.7061855	46.39
306.8638687	47.38
307.0136053	48.37
307.1724978	49.42
307.3301544	50.41
307.4822316	51.4
307.6268818	52.45
307.7558794	53.53
307.896879	54.52
308.0259378	55.52
308.1658156	56.57
308.2901803	57.56
308.4019938	58.55
308.5300088	59.53
308.6550475	60.53
308.7690615	61.53
308.8749251	62.58
309.0052072	63.63
309.1161581	64.68
309.23393	65.67
309.3592479	66.65
309.4545315	67.7
309.556164	68.69
309.6788554	69.68
309.7943591	70.74
309.8869232	71.74
309.9864045	72.73
310.0852442	73.72
310.1884636	74.72
310.2904771	75.72

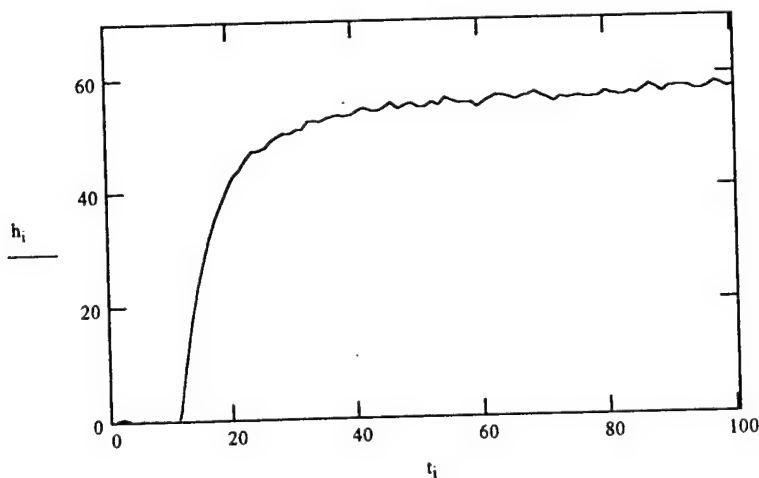
Erosion/Deposit #1 panels, 1 blower 08 Feb 01

Thermal diffusivity $\alpha := 0.000000058 \text{ m}^2/\text{s}$
 Thermal conductivity $k := .226 \text{ W/mK}$
 Prandtl number (for air) $Pr := 0.78$
 Dist from splitter plate to temp meas area $x := .9652 \text{ m}$
 Specific (heat for air) $C_p := 1044.5 \text{ J/kgK}$
 Density of air $\rho := 1.006 \text{ kg/m}^3$
 Velocity of flow $U_{inf} := 12.2 \text{ m/s}$
 Temperature of airflow $T_{inf} := 334.4 \text{ K}$

Total number of data points $N := 98$
 $i := 1, 2 \dots N$

$$q_i := \frac{2k}{\sqrt{\pi \cdot \alpha}} \sum_{j=1}^i \frac{(T_j - T_{j-1})}{\sqrt{t_i - t_j} + \sqrt{t_i - t_{j-1}}}$$

$$h_i := \frac{q_i}{T_{inf} - T_i}$$



$$h_{avg} := \sum_{i=30}^{50} \frac{h_i}{21} \quad h_{avg} = 53.615$$

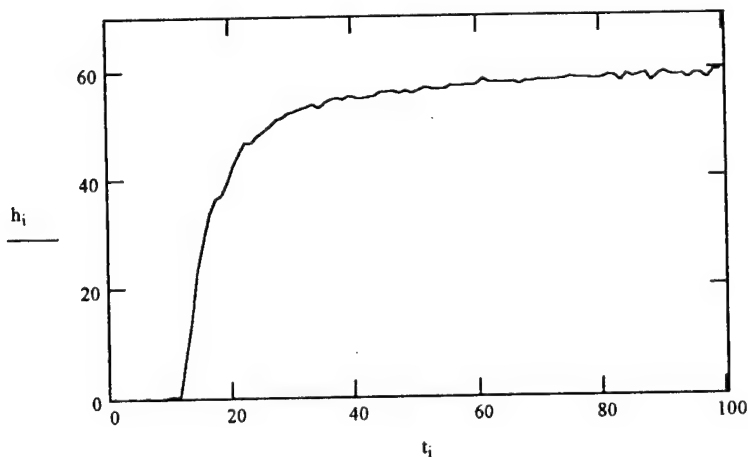
306.475552	38.398
306.656746	39.453
306.8398581	40.451
307.019492	41.457
307.185492	42.538
307.3448322	43.617
307.50623	44.634
307.6760654	45.639
307.8334047	46.879
307.9871847	47.937
308.134898	48.949
308.251917	49.935
308.3718934	50.93
308.549964	52.24
308.674588	53.338
308.827617	54.392
308.952516	55.458
309.0567937	56.456
309.169809	57.517
309.2783181	58.515
309.362207	59.511
309.4800892	60.561
309.5989144	61.566
309.7183157	62.554
309.8310941	63.605
309.934795	64.663
310.021937	65.677
310.1238957	66.664
310.2292441	67.715
310.335501	68.699
310.4259852	69.749
310.504645	70.752
310.5748801	71.8
310.665647	72.784
310.745413	73.782
310.8293331	74.768
310.916211	75.764
310.989933	76.761

Erosion/Deposit #2 panels, 1 blower 08 Feb 01

Thermal diffusivity $\alpha := 0.000000058 \text{ m}^2/\text{s}$
 Thermal conductivity $k := .226 \text{ W/mK}$
 Prandtl number (for air) $Pr := 0.78$
 Dist from splitter plate to temp meas area $x := .9652 \text{ m}$
 Specific (heat for air) $C_p := 1044.4 \text{ J/kgK}$
 Density of air $\rho := 1.009 \text{ kg/m}^3$
 Velocity of flow $U_{inf} := 12.25 \text{ m/s}$
 Temperature of airflow $T_{inf} := 334.1 \text{ K}$

Total number of data points $N := 98$
 $i := 1, 2 \dots N$

$$q_i := \frac{2k}{\sqrt{\pi \cdot \alpha}} \sum_{j=1}^i \frac{(T_j - T_{j-1})}{\sqrt{t_i - t_j} + \sqrt{t_i - t_{j-1}}} \quad h_i := \frac{q_i}{T_{inf} - T_i}$$



$$h_{avg} := \sum_{i=30}^{50} \frac{h_i}{21} \quad h_{avg} = 54.903$$

306.437256	38.267
306.832894	39.316
306.809131	40.376
306.964605	41.374
307.132116	42.433
307.289022	43.425
307.452717	44.409
307.615724	45.458
307.764711	46.441
307.895964	47.438
308.035559	48.421
308.159152	49.415
308.292577	50.399
308.442230	51.448
308.572424	52.496
308.691579	53.495
308.815068	54.546
308.943447	55.529
309.0688	56.576
309.190869	57.623
309.309263	58.673
309.426701	59.721
309.566148	60.789
309.672367	61.839
309.783874	62.885
309.882020	63.869
309.985728	64.917
310.083386	65.899
310.174529	66.946
310.275137	67.936
310.373212	68.983
310.475166	70.032
310.570213	71.09
310.658984	72.09
310.746540	73.075
310.841898	74.134
310.935467	75.128
311.017262	76.118
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Vita

Captain Jess W. Drab was born in Fort Knox, Kentucky. He grew up as a “military brat” and eventually graduated from Salem High School in Virginia Beach, VA in June 1991. After a long one-week rest, he entered the United States Air Force Academy in Colorado Springs, Colorado. Though interim details are fuzzy, he does recall graduating in the top 15% of his class on 31 May 1995 with a Bachelor of Science in Aeronautical Engineering and gaining a Regular Commission.

His first assignment brought him to the Reconnaissance System Program Office at Wright-Patterson AFB, Ohio, where he had the unique opportunity to work with the Global Hawk High Altitude Endurance (HAE) Unmanned Aerial Vehicle (UAV) from its inception as an idea on a sheet of paper, to wind tunnel testing the scale model, to flight testing the first three ships. In 1999, the HAE UAV Team won the Engineering Directorate’s Director’s Award for outstanding engineering achievement, and Captain Drab won the Junior Military Engineer of the Year Award. In the same year, he entered the Graduate Aeronautical Engineering program, School of Engineering, Air Force Institute of Technology. Upon graduation, he will be assigned to the Air Force Research Lab at Eglin AFB, Florida.

REPORT DOCUMENTATION PAGEForm Approved
OMB No. 0704-0188

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1. REPORT DATE (DD-MM-YYYY) 20-03-2001		2. REPORT TYPE Master's Thesis		3. DATES COVERED Jan 2000 - Mar 2001	
4. TITLE AND SUBTITLE TURBINE BLADE SURFACE ROUGHNESS EFFECTS ON SHEAR DRAG AND HEAT TRANSFER				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Drab, Jess, W., Captain, USAF				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Institute of Technology Graduate School of Engineering and Management (AFIT/EN) 2950 P Street, Building 640 Wright-Patterson AFB, OH 45433-7765				8. PERFORMING ORGANIZATION REPORT NUMBER AFIT/GAE/ENY/01M-01	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Department of Energy, South Carolina Institute for Energy Studies (SCIES) Attn: Dr. Richard A. Wenglarz Advanced Gas Turbine Systems Research 386-2 College Avenue Clemson, SC 29634-5711 (864) 656-2267				10. SPONSOR/MONITOR'S ACRONYM(S) DOE	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT This work used scaled samples of actual turbine blade surfaces to characterize correlations between turbine surface roughness, friction coefficient, and convective heat transfer rate--parameters which affect an engine's efficiency and the blade's lifespan. For erosion/deposits, friction coefficients up to 250 times higher and convective heat transfer coefficients of up to 150 times higher were found when compared to a flat plate baseline. Other roughness types (pitting and fuel deposits) yielded less dramatic results. These results did not follow existing friction coefficient-to-heat transfer coefficient correlations, such as the Reynolds analogy. While these analytical and empirical correlations hold for flat plates, they may be inadequate to describe the highly irregular surface roughness found on real in-service turbine blades.					
15. SUBJECT TERMS Turbine, Roughness, Friction, Heat Transfer, Infrared Camera					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (Include area code)
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